III. FILIPINO TYPES: RACIAL ANATOMY IN TAYTAY.[1]

A. THE MEN.

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A study of the physical characteristics of the people of Taytay was suggested by Doctor Freer in conjunction with the medical investigations to be made there in 1909. This study throughout the season of investigation was greatly facilitated by the kind coöperation of Doctors Clements and Nichols.

A series of observations was conducted on about 500 individuals, forty measurements of each individual being made by Doctor Bean, and transcribed by Mr. Planta. The head measurements were performed in accordance with the prescribed regulations of the International Congress of Anthropologists assembled at Monaco in 1906(10,14), and the body measurements in accordance with the personal instructions of Professor Monouvrier(3). Additional observations on the ear type, color of eyes, structure of hair, etc., were carried on, and sagittal outlines of the head from inion to nasion were produced with the cephalograph(7). The statistical part of the work was done by Mr. Planta, who alone is responsible for the averages, although every calculation has been verified until its accuracy is assured. Doctor Bean alone is responsible for the interpretation of the results and the writing of the paper.

This study is divided into six parts: I, Physical Measurements; II, Descriptive Characters; III, The Segregation of Types; IV, Ear Type and Species; V, Diseases and Species; and VI, Conclusions, The Separation of the Types into Systematic and Elementary Species.

GENERAL CONSIDERATIONS.

The town of Taytay probably contains a more mixed population than the average Filipino town at the same distance from the coast (20 kilometers), for the following reasons: It is near enough to Manila (15 kilometers) to receive some of the overflow of the population from that city, and perhaps for this reason and because of its pleasant location on an elevated knoll at the base of the foothills of adjacent mountains, it is the country residence of some of the Government's high Filipino officials. The proximity to the town of the hills and mountains is sufficient to attract the hill people, and its situation on the borders of Bay Lake (Laguna de Bay) attracts the fisher folk. It is only a few kilometers from Pasig, the capital of Rizal Province, where a mixed population of Filipinos, Americans, Spaniards and Chinamen reside. The pilgrims [illegible] Antipolo, situated in the hills, pass through Taytay, and one of the most important industries of the place is the transportation by cart and hammock of many thousands of passengers on this pilgrimage during the month of May each year. Finally, the town of Cainta, where a garrison of British soldiers, natives of India, are reported to have been left when the British evacuated Manila one hundred and fifty years ago, is little more than a stone's throw from Taytay, and there has probably been an infiltration of the Indian element into the latter place.

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[1] These studies form a part of those carried on during the medical survey of the town of Taytay, the remaining papers on which have already been published in Sec. B. 4 (1909) of this Journal—CO-EDITOR.

The individuals measured were those who came to the dispensary and they should be considered in part as a hospital population, but the majority showed no other affliction than infestation with intestinal parasites and many were only friends of the sick who came with them as companions. The resulting components of this randon sample represent more nearly the normal average of the population than if a selected group such as recruits, students [illegible] other homogenous bodies of people had been taken. Therefore it may be assumed fairly that the individuals herein presented are typical of the littoral population of the Philippines, although a larger percentage than usual belongs to the hospital population, and the Indian element may exert a small influence.

I. PHYSICAL MEASUREMENTS.

STATURE.

Topinard(31) classified the races of men by stature as follows:

	Men.	Women.
Small	below 160 cm.	below 140 cm.
Below medium	160-165 (inclusive)	140–153 (inclusive)
Above medium	165-169 (inclusive)	153–157 (inclusive)
Tall	above 170	above 158

The Taytayans, according to this classification, are on the border line between the *small* races and the races *below medium* height. The average of 183 adult males is 159.47 centimeters. The minimum is 145.7 centimeters and the maximum is 171.0 centimeters. The stature is 5.47 centimeters greater than that of 104 adult male Igorots(3), but the distance between the extremes is not so great. The extremes should be separated more in 183 individuals than in 104, if the composition is the same. However, this is not true of the two groups, Igorots and Taytayans, from which the inference is that the stature of the component elements forming the Igorots was more diverse than that forming the Taytayans.

The Igorots are apparently derived from a *tall* stock (170 centimeters), a small stock (148 centimeters), and a stock below medium height. The Taytayans are probably derived from both the latter stocks, and, in addition, their stature has been influenced by Spanish and Chinese elements. The Spanish are slightly below medium stature and the Chinese are *slightly above*, although the Northern Chinese (Manchus) are tall (8,10,14,17,22,35); the two original stocks were *small*. A combination of these elements with a greater proportion of the original stocks could easily produce an average stature of 159.17 centimeters. The curve of stature illustrates how this might result. There is a summit at 156 centimeters where the mode is found, there is another summit at 162 centimeters, and a break of the curve at 168. The first summit includes the greatest number of individuals with the same stature, a *small* stature, that would represent the primary stocks; the second summit has fewer individuals and a stature below medium, which represents the Spanish; and the break *above medium* stature, with still fewer individuals, represents the Chinese. The Spanish element is apparently in excess of the Chinese but is not present in so great a number as the primary stocks. The presentation of types in a subsequent part of this paper corroborates the inferences stated here.

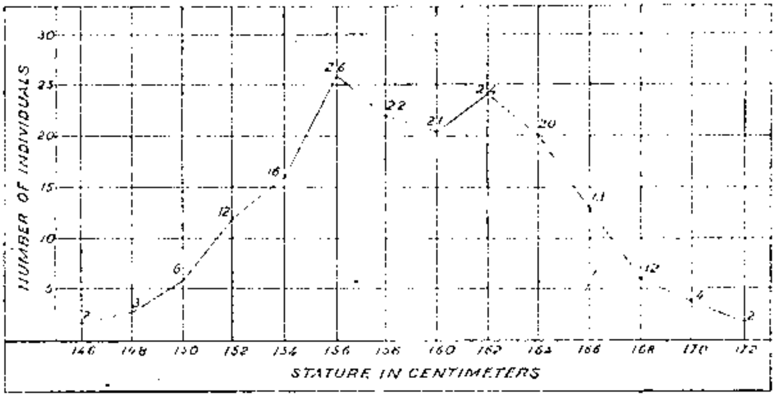

FIG. 1.—CURVE OF STATURE OF 183 ADULT MALE TAYTAYANS.

The stature of the Taytayans exceeds that of the inhabitants of the inland part of the Malay Peninsula (18), that of the Veddahs of Ceylon (24), the Dyaks of Borneo (18), the Dravidians of Bengal (18), the Annamites in general (10), the Igorots (3), the Ainos and the Japanese (18); it is practically the same as the Malays of South Perak (18), and the Menangkabau-Malayan of Hagen (12); and it is less than that of the Chinese (12,18), Coreans (18), Javanese (12,17,30), Sumatrans (39), North American Indian (13), the African and North American Negro (31), and practically the whole body of European and American whites (10,23,31,36).

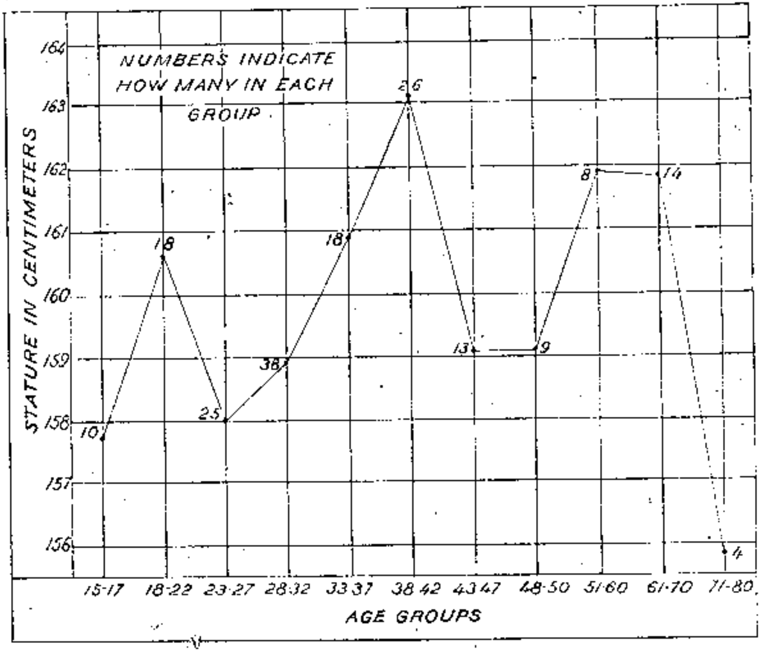

FIG. 2.—STATURE AND AGE.

STATURE AND AGE.

This array presents a bizarre effect, and no deductions may safely be drawn from the correlation of stature and age. However, the facts speak for themselves.

The age is only approximate as indicated by the manner of grouping.

For instance, there are 6 men at the age 20, but only 4 at 19 and 1 at 21; there are 7 at 25, but only 2 at 24 and 2 at 26; there are 15 at 30, but 4 at 29 and 2 at 31; there are 9 at 35, but 2 at 34 and 1 at 36; there are 13 at 40, but 3 at 39 and 2 at 41; and there are 7 at 45, and but 1 at 44 and 1 at 46. Therefore, it seems justifiable to group the ages in series of 5 except that the ages 15 to 17 form one group and the age groups above 50 are in series of 10.

Accordingly, the stature appears to increase from 15 to 20, to decrease from 20 to 25, to increase from 25 to 40, to drop considerably at 45 and 50, to increase again at 60 and 70, and finally to reach a stature at 80 that is less than that below 20. There is a fastigium at 40, the stature increasing up to that age and decreasing thereafter. The individual with the smallest stature is aged 38, and the one with the tallest, aged 33. There are 58 individuals above the age of 20 who have a stature less than the average of the group aged 15 to 17. For this and other reasons the few individuals below the age of 20 are included as adults in this study. The conclusion reached is that stature in age groups is a matter of the chance types that were measured at each age rather than altered stature due to age. If the stature increases to the age of 40, this would indicate that the Filipino reaches maturity in stature late in life, and if the stature at age 15 is equal to that in adult life the Filipino reaches maturity at an early age. Both may be true. There may be an early rapid maturity that is premature, and a late ripening that is real maturity, or some types may mature early and others late, or there may be waves of progression superceded by regression, although the last is very improbable.

There is no such regularity in the increase of stature as found among the Igorots, and the fastigium for the latter was between 20 and 30 instead of about 40. The fastigium for stature of the following peoples from records of more than a million individuals(31) is given for comparison with the people of Taytay:

	Years
North American Irish	31–34
English	29
Scotch	28
French	27
Scandinavian	25
German	23
Igorot	20–30
Taytay	40

Liharzig gives the twenty-fifth year, Villermi the twenty-third.

SITTING HEIGHT.

This linear dimension is the distance between the ischial tuberosity and the vertex of the head when the person is sitting erect. It may be divided into three parts, the total head height, from the chin to the vertex; the neck length, from the chin to the suprasternal notch; and the body length, from the suprasternal notch to the pubic spine; although the three dimensions do not quite equal the sitting height because the pubis is several centimeters higher than the ischial tuberosities.

The average sitting height of 181 adult males is 83.99 centimeters with minimum and maximum of 74.3 and 91.7, respectively. It is 7.6 centimeters more than the distance from the trochanter to the vertex, 6.9 centimeters more than the distance from the pubic spine to the vertex, and 0.9 centimeter more than the total leg length. It is 53.3 per cent of the stature which is 0.8 more than the European according to Topinard, and 3.9 less than the length "Scheitel bis Damm" of 130 Europeans (Swiss?) measured by Hoffmann and given in Vierordt's tables(36). The sitting height of 60 Apache and 53 Pima Indians of the southwestern United States measured by Hrdlicka(13) is 53.2 and 52.9 per cent respectively, which is practically the same as my figures for Taytay.

Soularue(29) approximates the relative body length by comparing the length of the vertebral column of 174 skeletons to the calculated stature, and concludes that the white and yellow races have relatively long bodies and short legs compared with the black and other races. The North American Indian is intermediate between the yellow and the black races which are less than the white in body length.

The length of the body is measured in so many ways by different men that one is at a loss to know which method to select. The distance from the suprasternal notch to the symphysis pubis is the easiest and most direct method and lends itself to photometry as well as anthropometry. Although it is variable on account of the movable points from which it is measured, it is probably as exact as any other. The acromion to the symphysis is probably more variable, and the suprasternal notch to the trochanter is scarcely less so. The length of the vertebral column is the actual body length, and can be measured from the nasal spine to the pubis, but these are also variable points.

The average body length of the Taytayans from the suprasternal notch to the symphysis pubis is 47.1 centimeters, from the suprasternal notch to the trochanter it is 45.8 centimeters, and from the acromion to the symphysis pubis it is 47.8 centimeters.

The body length of the inhabitants of the inland part of the Malay Peninsula (18), (p. 283), measured from the suprasternal notch to the trochanter (?), averages from 43.5 centimeters in the Senoi I, to 47.2 centimeters in the Western Senoi. The body length of the inhabitants of central Sumatra (39), measured from the acromion to the symphysis pubis, averages 45.2 centimeters. The body length of the Igorots (3) (p. 431) from the suprasternal notch to the pubis in 47.7 centimeters. Topinard (31) (p. 1068) gives the body length "de la fourchette du sternum au siege" in relation to the stature which may be compared with that of the Taytayans in the following table:

Body length in relation to stature.

Group.	Relative body length.	Author.	Number of individuals.
Europeans	33.5	Topinard	280
Kabyles	32.5	do	163
Annamites	30.2	do	27
Kalmucks	34.6	do	6
Taytayans	33.6	Bean	170

This places the relative body length of the Taytayans in the same class as the Europeans and it is different from the Annamites.

Differences of body length can not mean a great deal until the methods of measuring the body have been unified, and the basis for the body length should be the distance from the suprasternal notch to the symphysis pubis. At least this measurement should be made and utilized in a comparison of different people.

The total head height (chin to vertex) is 23.2 centimeters for Taytay, which is 14.5 per cent of the stature or nearly that of the Chinese.

Topinard(31) (p. 1071) assigns the greatest total head height to the Chinese, the least to the European, and places the Negroes of Africa near the latter and the Negroes of Oceania near the former.

The European has 7.5 heads of stature, the Negro, 7 heads of stature, and the yellow people, 6.5 heads of stature. The Taytayans are therefore like the Negro in total head height, because this is $^1/_7$ of the stature. The total head height of the Igorots(3) (p. 437) is 21.6 centimeters and their stature is exactly the same as the Taytayans in relation to it.

The neck length of the Igorots is 0.3 centimeter less than the Taytayans, which is 7.39 centimeters. This is the same as that of the Besisi of the Malay Peninsula, (Martin) (18)and of the Japanese, but it is greater than that of the Senoi.

It has been demonstrated that the Filipinos of Taytay resemble the Negroes, the Europeans, the Chinese, the North American Indians, and the East Indian peoples; therefore it can not be doubted that they represent a much mixed population and that many diverse types are to be found among them. This becomes more evident as we proceed, and finally an attempt will be made to select some of the types and to relate them to the people from whom they were derived.

LOWER EXTREMITY.

The total length of the lower extremity, as determined by the height of the trochanter from the sole of the foot when the person stands erect, is 83.08 centimeters for 170 adult males, with a minimum of 72.8 centimeters and a maximum of 93.5 centimeters. The height of the trochanter is 1.3 centimeters greater than that of the pubic spine. It is 3.92 centimeters higher than the Igorots which is 1.8 centimeters greater than their pubic spine. The relatively greater trochanter height of the Igorots is probably due to the heavy fascia and muscles that cover the trochanter in these hardy mountain climbers, thus projecting upward its palpable part. However, the trochanter height of the Igorots in relation to stature is but 51.6, whereas that of the Taytayans is 52.1; therefore the lower extremity of the latter is both absolutely and relatively longer than the Igorots.

Hoffmann(36) gives the trochanter height of 130 European males as 89.8 centimeters. Topinard(31) (p. 1074) gives the relative trochanter height as follows:

30 Belgians	52.0
12 Arabs	52.6
13 Berbers	53.6
27 Annamites	50.2
3 Esquimaux	50.7
10 Negroes	53.1

This places the Taytayans intermediate between the Annamites and Negroes and almost the same as the Belgians and Arabs.

The relative public height by Topinard(31) (p. 1074) is somewhat different:

1,061 Whites	50.3
27 Annamites	51.2
2,020 Negroes	51.8

That of the Taytayans is 51.3 which approximates the Annamites and is between the white and the Negro, although nearer the latter than the former.

Martin's(18) Malays (p. 260) present a variable average length of the inferior extrémity from 76.3 centimenters to 83.2, and the relative length varies from 51.2 to 53.3. This length is estimated by subtracting 4 centimeters from the height of the anterior superior iliac spine, therefore it is comparable neither with the trochanter nor with the pubic height. However, Martin gives a long list of trochanter heights of other peoples from which we extract a few:

Group.	Absolute.	Relative.
Japanese students	78.1	48.5
Japanese workmen	81.2	50.0
North Chinese	83.8	50.0
South Chinese	83.9	51.9
Ainos	81.8	51.5
Europeans		52.0
Kru Negroes	91.0	56.0
Taytayans	83.08	52.1

The trochanter height makes the Taytayan resemble a European similar to the Ainos and Southern Chinese.

The lower extremity offers three parts for examination, the upper leg from the trochanter to the knee, the lower leg from the knee to the ankle, and the ankle height from the ankle to the sole, to which may be added another, the leg minus foot equal to the length of the lower leg plus that of the upper leg.

LEG MINUS FOOT.

This may be given best in three groups recently measured.

Group.	Absolute.	Relative.	Number.
Martin's Malays (p. 260)	70.9–76.8	47.2–49.7	100 ?
Igorots	74.0	48.1	101
Taytayans	76.5	48.0	175

The relative length does not vary greatly in the three groups, but the absolute length is greater for the Taytayans than for the Igorots or for the majority of Martin's Malays.

UPPER LEG.

The absolute upper leg length from the trochanter to the skin line of the knee of 176 men of Taytay is 39.2 centimeters and the relative length is 24.6. The Europeans of Hoffmann(36) (p. 15) have an absolute length of 41.9 centimeters and a relative length of 20 (Topinard)(31). Martin(18), however, gives the relative length for Europeans as 24 to 28. The Igorots have an absolute length of 38.0 centimeters and a relative length of 24.7, whereas the Malays of Martin(18) (p. 265) have an absolute length of 38.5 to 42.2 centimeters and a relative length of 23.6 to 26.5, which is greater than that of the Igorots and Taytayans absolutely and relatively.

The upper leg length (Topinard(31), p. 1011, Martin(17), p. 265) increases absolutely and relatively from the Asiatic through the African to the European. Soularue(29) gives the following length of the femur in different groups of men:

Group.	Absolute.	Relative.
American	41.6	29.1
Negro	42.3	28.8
Asiatic	43.1	28.9
Polynesian	44.1	29.3
European	44.3	29.4

The absolute length varies considerably but there is no great difference in the relative length. We may conclude from the foregoing facts that the length of the femur and of the upper leg is a matter of stature rather than of race.

LOWER LEG.

The length of the lower leg from the knee to the ankle for 175 men of Taytay is 37.29 centimeters absolutely, and 23.37 relatively; that of the Igorots is 36 and 23.4 respectively.

Martin's Malays vary from 31.4 to 35.4 centimeters absolutely and from 20.8 to 22.7 relatively. For Hoffmann's Europeans, Vierordt(36) gives 39.6 and 23 centimeters respectively, and Martin(18) gives 22 to 24 centimeters for the relative length of the Europeans.

The lower leg length (Martin(18), Topinard)(31) increases relatively and absolutely through the Asiatic and European to the African. Soularue(29) gives the following:

Group.	Absolute.	Relative.
Asiatic	34.6	23.2
American	35.2	24.9
Negro	35.8	24.5
European	35.8	23.9
Polynesian	36.8	24.4

The Taytayan resembles the Polynesian and is more like the European than like any other group, although resembling more the Asiatic than the Negro or American Indian.

THE TIBIO-FEMORAL INDEX OR CRURAL INDEX.

The length of the tibia multiplied by 100 and divided by the length of the femur, or, on the living, the length of the lower leg multiplied by 100 and divided by the length of the upper leg, gives the tibio-femoral index, which represents the length of the lower leg in terms of the upper leg equal to 100.

The tibio-femoral index of the Taytayan men is 95.1. For purposes of comparison, a table is given with the tibio-femoral indices of various groups by different authors.

Tibio-femoral index on the living.

Group.	Index.	Number of individuals.	Author.
Veddahs	80.4		Martin.
Malays	79.1-88.4	74	Do.
Sumatrans	87.0	57	Kleiweg de Zwaan.
Alas	90.8		Hagen.
Neu Mechlenburger	97.4		Do.
Igorots	94.7	104	Bean.
Europeans	91.3	130	Hoffmann.

To this may be added a few records on the skeleton.

Tibio-femoral index on the skeleton.

Group.	Index.	Number of individuals.	Author.
Europeans	79.7		Broca.
Negroes	81.3		Do.
Europeans	81.1	77	Topinard.
Negroes	82.9	32	Do.
Grimaldi	83.8	2	Verneau.
Cro-Magnon	81.2-86	4	Do.
Japanese	80.6	4	Soularue.
Malayo-Polynesia	82.1	13	Do.
Chinese and Annamese	83.6	22	Do.
Europeans	81.5	19	Do.
Negroes	86.8	21	Do.
Negritos	88.1	6	Do.

It is evident from the above that the tibio-femoral index differs in the different groups of individuals, and there is a transition through the Asiatic and European to the African. The Taytayans have a higher index than the Asiatic or European, and I believe we can safely say a lower index than the Negro or Negrito.

THE ANKLE HEIGHT.

This is 6.5 centimeters for the Taytayans, 5.4 centimeters for the Igorots and 7.8 for the Europeans according to Hoffmann. The Taytayans are almost exactly intermediate between the Igorots and the Europeans, which may be significant and can be taken to mean that the Taytayans represent a cross of the early Malay and the later European peoples.

THE UPPER EXTREMITY.

The total length of the upper extremity is the distance from the acromion process to the tip of the middle finger with the arm hanging straight by the side. This may be divided into three parts, the upper arm from the acromion to the head of the radius, the forearm from the head of the radius to its styloid process, the hand from this point to the tip of the middle fingers, to which may be added a fourth part, the arm minus hand by combining the length of the upper arm and forearm. The absolute length of the upper extremity of 176 Taytayans is 72.97 centimeters and the relative length is 45.8, which is greater than that of the Igorots(3) (absolute, 67.82 centimeters, relative, 44.0 centimeters), of the Malays(18) (absolute, 64.5 to 71.8 centimeters, relative, 43.1 to 45.9 centimeters), of the Sumatrans(39) (absolute, 70.34 centimeters, relative, 44.62 centimeters), is the same as the Battaks(12) (absolute, 73.4 centimeters, relative, 45.8 centimeters); and it is less than the Ainos(18) (relative, 46.0 centimeters) and the Veddahs(18) (absolute, 73.9 centimeters, relative, 47.0 centimeters). It is about the same as the European(18) (relative(18), 45.5; relative(31), 45.0, absolute(36), 74.2).

The upper extremity of the Negro is not longer relatively than that of the European according to Topinard(31) (Negro, 45.2, European, 43.2 to 45.5 centimeters) although Keane(14) (p. 36) gives the long upper extremity of the Negro as an important differential character. Soularue(29) (p. 375) finds little difference between the two in the combined length of the humerus and radius in relation to stature, which is 37.3 for the Negro and 36.8 for the Europeans. Topinard(31) (p. 1036) gives the relative length as 35.5 for the Negro and 35.0 for the European.

The upper extremity of the Negro may be a trifle longer relative to stature than is the European, but whatever the difference, it is slight and the Taytayan is not so greatly unlike either one.

THE ARM MINUS HAND.

This linear dimension is 55.42 centimeters absolutely, and 34.7 in relation to stature in 175 Taytayans. The same dimension of the Igorots varies from 50.5 to 53.9 centimeters absolutely and from 33.3 to 33.6 relatively. Among the Malays(18) (p. 247), it varies from 48.5 to 53.1 centimeters absolutely and from 31.6 to 34 relatively. Referring to the length of the humerus plus the radius as given above, it is clear that the Taytayan is more like the Negro and the European than like the Igorot or the inhabitants of the Malay peninsula.

THE UPPER ARM.

The absolute upper arm length of 175 Taytayans is 32.37 centimeters and the relative arm length is 20.3. That of the Igorots is from 28.6 to 30.6 centimeters absolutely and from 18.7 to 19.8 relatively, and that of the Malays(18) from 27.6 to 30.7 centimeters absolutely and from 17.9 to 19.8 relatively.

The 130 Europeans of Hoffmann have an absolute length of 31.2 centimeters and a relative length of 18.5. Topinard(31) gives the European's relative length 19.5. The following figures are taken from Martin(18) for comparison:

The upper arm lengths of various peoples.

Group.	Absolute.	Relative.
Japanese students	26.2	16.9
Japanese (fine)	29.7	18.3
Senoi	28.0	18.0
Malays	30.3	18.9
Jews	30.7	19.0
Germans		19.0
South Chinese	31.1	19.2
Ainos	30.3	19.3
Veddahs	31.0	19.4
Battaks	31.1	19.4
Malays	31.7	19.6
Europeans		19.8
Sikhs	34.2	20.1
Taytayans	32.37	20.3
Highland Igorots	29.8	19.8

The relative length of the humerus as given by Soularue in several groups follows:

Malayo-Polynesian	20.1
Negroes	20.2
Europeans	21.3
Yellows	21.5
Arabs and Berbers	22.0

From the foregoing it may be inferred that the Taytayans resemble in the upper arm length the Europeans, Sikhs, American Indians, Chinese, Arabs and Berbers more than they do the Japanese, Senoi and Negroes, and they are not greatly different from the Highland Igorots.

THE FOREARM.

The length of this part is 23.05 centimeters absolutely in 176 Taytayans and 14.45 relatively. Among the Igorots(3) (p. 424) it varies from 22.0 to 23.3 centimeters absolutely and from 14.4 to 14.8 relatively, and among the Malays(18) (p. 250) from 20.1 to 23.6 absolutely and from 13.3 to 15.2 relatively.

For Europeans, Hoffmann(36) (p. 15) gives 24.6 centimeters absolute and Topinard(31) gives 14 relative. The following list is taken from(18) Martin (p. 255) for comparison:

Group.	Absolute.	Relative.
Senoi	21.3	13.8
Japanese	22.7	14.1
Veddahs	22.9	14.3
Europeans		14.4
Malays	23.7	14.8
South Chinese	25.0	14.8
Sikhs	27.5	15.2
Ainos	23.9	15.3
Battaks	24.1	15.5
Germans		15.9
Jews	25.8	15.9
Negroes		16.5–17.1
Congo-Negroes		18.6

Topinard(31) (p. 1087) places the relative length of the forearm in the Negro above that of any other people, although three Kaffir Negroes were less than some Europeans and Asiatics.

The Taytayans are intermediate between the Negro and the Japanese or Senoi, and almost exactly the same as the European.

The length of the radius as given by Soularue and Topinard may be compared with the length of the forearm as already given.

Group.	Relative.	Author.
Europeans	15.5	Soularue.
Asiatics	15.7	Do.
Arabs-Berbers	15.9	Do.
Malayo-Polynesians	16.0	Do.
Americans	16.2	Do.
Negroes in general	17.1	Do.
Europeans	14.3-14.9	Topinard.
Asiatics	14.1-15.6	Do.
Negroes in general	15.2-15.7	Do.

The length of the radius separates the European and Negro still further than does the length of the forearm, which indicates that this dimension is a good differential factor for large groups of individuals. The length of this part in relation to the upper arm may also help to differentiate the world's groups of people.

THE RADIO-HUMERAL INDEX OR BRACHIAL INDEX.

This is equal to the radius times 100 divided by the humerus, or, in the living, it is the forearm times 100 divided by the upper arm. For 175 Taytayans it is 71.2, for 104 Igorots(3) (p. 425) it is 76.2, and for the Malays(18) (p. 252) 73.2 (Senoi 76.0).

Topinard gives the European 82.2 to 86.8 and the Negroes 87.9 to 93.4. Martin found the brachial index unsatisfactory as a differential factor because of the varied results of different authors, due no doubt to lack of a uniform standard for taking the measurements. However, Hoffmann(36) makes the European index 78.8 on the living, and Annandale(18) (p. 147) gives that of the Semang as 98.7. The radio-humeral index (skeleton) given by Soularue(29) follows:

19 Europeans	73
12 Chinese and Annamese	75.4
22 Americans	76.3
13 Malayo-Polynesians	76.8
21 Negroes of Africa	78.0
6 Negritos	78.3

There is a gradual transition from the European to the African. Evidently the Taytayans are more like the European than like the Negro or Negrito.

THE HAND LENGTH.

The absolute hand length of 176 Taytayans is 17.55 centimeters and the relative is 11.05, that of the Igorots(3) (p. 424) is 16.0 to 17.8 centimeters absolutely and 10.6 to 11.3 relatively, and of the Malays(18) (p. 250) is 16.0 to 18.7 centimeters absolutely, and 10.5 to 12.5 relatively.

Martin gives the following for other peoples.

Group.	Absolute.	Relative.
South Chinese	16.3	10.1
Javanese	16.8	10.2
Malay	16.9	10.5
Battaks	17.0	10.6
Sikhs	17.8	10.7
Senoi	16.8	10.9
Jews	18.5	11.2
European		11.3
Japanese students	18.7	11.5
Veddahs	18.4	11.5
Ainos	18.4	11.7

The Europeans (Hoffmann(36) and Topinard(31)) have an absolute hand length of 18.4 centimeters and a relative hand length of 11.5.

From these measurements the Taytayans would be placed in the midst of the groups given above and in hand length they are not a great deal less than the Europeans.

Krause(36) gives the distance from the knee to the middle finger with the arm straight at the side as 14 centimeters in Europeans and only 5 to 8 centimeters in Negroes.

In the Taytayans the same distance is 13.83 centimeters, which is practically equal to that in the Europeans.

THE INTERMEMBRAL INDEX.

This may be represented best by the four long parts of the extremities: upper arm, forearm, upper leg and lower leg, on the living, and by the corresponding bones: humerus, radius, femur and tibia on the skeleton. The index is the length of the upper extremity, or upper arm plus forearm, in terms of the lower extremity, upper leg plus lower leg, when the latter equals 100. For the Taytayans it is 72.4, for the Igorots(3) (p. 457) it is 69.2 to 70.6, and for the Malays(18) (p. 267) it is from 63.7 to 71.4.

Soularue(29) gives the following on the skeleton:

Europeans	69.1
Chinese and Annamese	68.5
Americans	69.0
Negroes	68.3
Negritos	69.0
Australians	69.1

Apparently the lower extremity of the Negro is relatively long and the upper is relatively short. The difference is slight and this factor is not so good a differentiator as others.

The facts hereinbefore presented are given in the usual manner with a system of averages which may be of assistance in establishing differences and resemblances of various groups of men, but it is not of much assistance in fathoming the complex consistency of the group under consideration. This must be done in a different way, and the only way that presents itself as feasible is to study the individuals(38). This we will do presently by grouping them so that the individuals of each group resemble one another. The object in view in giving the measurements that have gone before was to convince anyone that very little could be derived from such a study except what was known before.

We have already demonstrated that the stature of the Taytayan is similar to the other eastern Asiatic and Pacific peoples; the sitting height is the same as that of the North American Indian; the body length is the same as the European's; the total head height resembles that of the

Negro; the length of the lower extremity is the same as that of the European; the tibio-femoral index is intermediate between that of the Asiatic-European and the Negro-Negrito; and the total length of the upper extremity is like both Negro and European. The upper arm length resembles that of the European and the Sikh, and the forearm length is exactly that of the European, but different from either the Japanese on the one hand or the Negro on the other; and lastly, the Taytayan is more like the European than the Negro or Negrito in the brachial index and the hand length. At the beginning of this paper it was stated that the Taytayans are probably derived from mixtures of Filipinos, Chinese, Spanish, and East Indian elements. This has been established by body measurements. There is also evidence of some relationship with the Negro although there is considerable evidence that the greatest amount of resemblance is for the European. When the types are established it will be seen that a majority of them are European, and that a majority of the individuals pertain to the European types.

THE AVERAGE TAYTAYAN—A TYPICAL FILIPINO?

The individual represented by serial number 99, clinical number 176, is almost exactly equal in every dimension to the average of the first 100 measured, and to the total average; therefore he may be taken to represent the type of the Taytay population, if this constitutes a type. This man is an Australoid with a cephalic index higher than usual, indicating some Primitive influence or a slight dorsal flattening of the head. The head outline is low in front but the *front bombé* is seen (fig. 3). The occiput neither bulges nor is it much flattened, the vertex is high, the glabella prominent. Australoid and Primitive are both represented, but Iberian can not be excluded.

The radio-humeral index is 67.8, the tibio-femoral is 91.2 and the intermembral is 74. Negroid characteristics are lacking, but European characteristics are in evidence. One can safely say that a typical Filipino (?) of to-day is European rather than Negroid but retains Primitive characteristics.

THE TAYTAYAN, THE EUROPEAN AND THE NILOTIC NEGRO.

It may be of interest to compare the average linear dimensions of these three groups of individuals to determine similarities and differences.

The Nilotic Negroes were recently measured by the late Dr. Alexander MacTier Pirrie, and reported by Dr. David Waterston (38) from the Anthropological Laboratory of Edinburgh University in 1908. The Nilotic Negroes include the whole native population "extending from the western frontier of Abyssinia across the Nile Valley, through the Barh-El-Ghazal region westwards to the Central Niger, and from about 200 miles south of Khartoum, to the northeastern shores of Lake Nyanza."

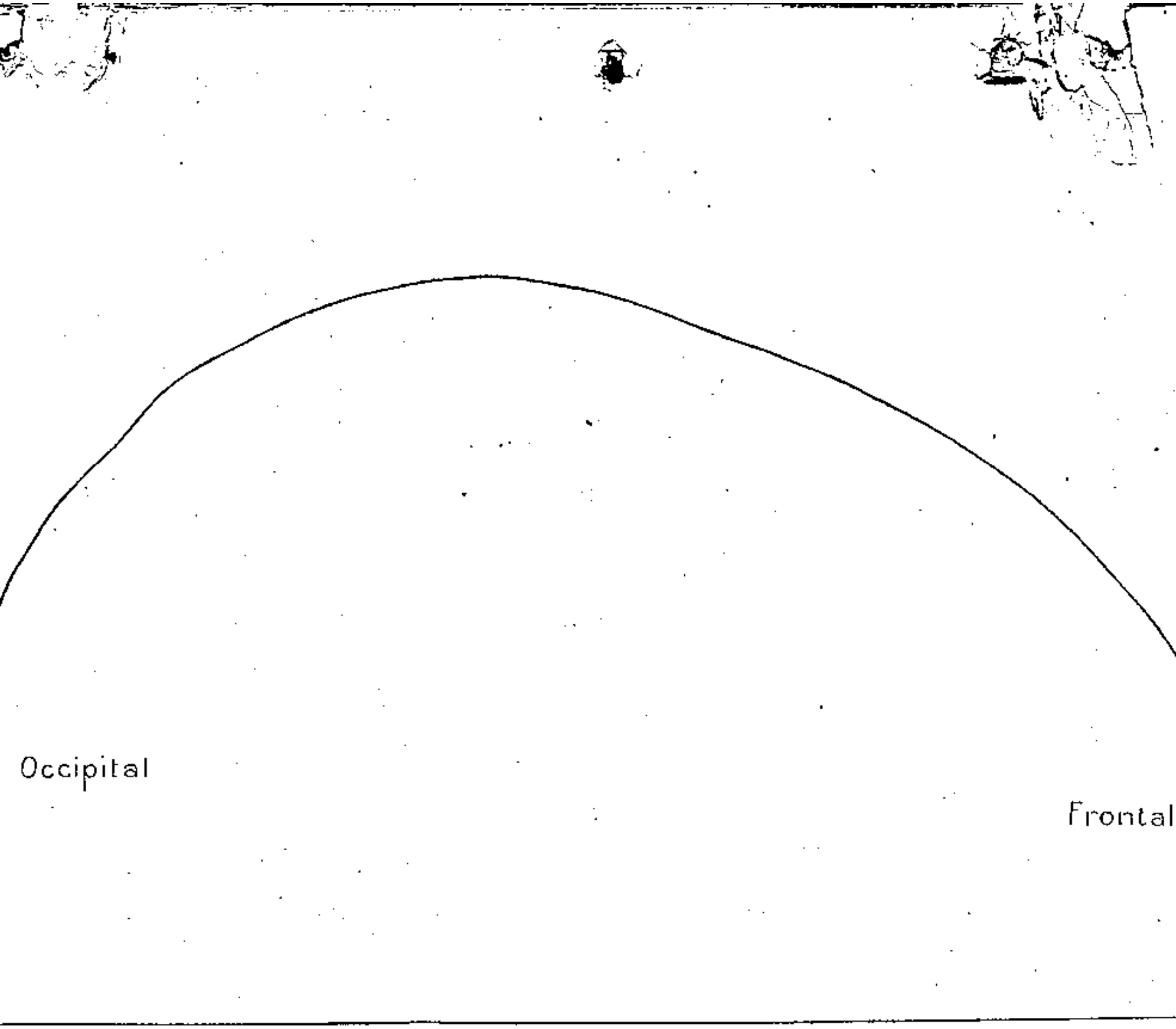

FIG. 3.—AVERAGE TAYTAYAN. SERIAL NO. 99. CLINICAL NO. 176.

The individuals measured are distributed among 12 different tribes, the Dinkas (60 males) and the Buruns (43 males) making more than half the number.

The Dinkas are the tallest and have relatively the shortest limb parts of all the groups. The averages and indices of the measurements of 187 adult males are given in a table at the end of Waterston's paper from which we extract the following:

Character.	187 Nilotic Negroes.		183 Taytayans.		130 Europeans.[a]	
	Absolute.	Relative.	Absolute.	Relative.	Absolute.	Relative.
Stature	168.25–**180.16**	100.00–100.00	150.17	100.00	167.80	100.00
Upper leg length	40.70– 47.00	**25.80**– 28.00	30.20	24.60	41.90	25.00
Lower leg length	39.60– 44.42	**24.40**– 24.80	37.29	23.37	39.60	23.60
Upper arm length	32.00– 31.79	**18.60**– 19.30	32.37	20.30	31.20	18.60
Forearm length	28.68– 31.08	**17.10**– 17.70	23.05	14.45	24.60	14.70
Tibio-femoral index	89. 5– 98.6		95.1		94.5	
Radio-humeral index	87. 6– 92.9		71.2		78.8	
Intermembral index	68. 4– 77.4		72.4		68.4	

[a] Hoffmann in Vierordt's tables (Swiss men?). The black faced type represents the figures for the group of Dinkas (60 males).

The stature of the groups of Negroes ranges from above medium to tall, the European is above medium, and the Taytayan is small.

The limb parts of the Negro are longer individually and collectively, absolutely and relatively, than those of the European or Taytayan, except the relative upper arm length which is the same for the European as for the group of Negroes that has the smallest relative length, and is greater for the Taytayan than for either the Negro or the European.

The absolute upper arm length of the Taytayan is measured from the upper edge instead of the lower edge of the acromion process to the elbow, and this may make it about 1 centimeter longer than it should be, therefore it is probably the same as the European, and less than the Negro. However, even a greater reduction than 1 centimeter would not reduce the relative length as low as either of the other two peoples. The relative length of the upper arm is therefore a distinctive feature of the Taytayan, is different from the European, and even surpasses the Negro (cf. Japanese (3)).

The absolute and relative forearm length of the Negro is so much greater than that of the other two peoples that it may be at once designated as the most characteristic limb quality of the Nilotic Negro.

The tibio-femoral index of the various groups of Negroes gives both lower and higher figures than those of Taytay and of the Europeans, and if all the groups of Negroes are averaged the index would not be different from the other two. It may be significant, however, that some groups of Negroes have a high index and others have a low one; the same condition is found among the Taytayans where a low index pertains to some types and a high index to others. One Negro had an index of more than 100, and one or more among the Taytayans have like indices.

The radio-humeral index is greater for the Negroes than for the others, because of their great forearm length. The Taytayan, because of the great upper arm length, is more distantly removed from the Negro by this index than by any other factor of the limb measurements.

The intermembral index puts the Taytayan intermediate between the extremes of the Negroes and separates them from the Europeans.

The Negroes, except one group, have longer arms in relation to their leg length than the European.

After all is said, one must admit that in the limb parts the differences that separate the three peoples are not great except in the long forearm of the Negro and the long upper arm of the Taytayan.

We now arrive at a consideration of the artistic canon of the Taytayan from the measurements that already have been discussed.

ARTISTIC CANON.

For the purpose of comparing the Taytayan with the European from the standpoint of the artist, the canon of Fritsch(30) (p. 197) is used in the same way in which it was used for the Igorots(3) (p. 451). The length of the vertebral column as represented by the distance from the symphysis pubis to the nasal spine is taken as the base line, and all other linear dimensions are given in relation to that. A glance at the chart (fig. 4) will show that the total head height, the length of the upper and the length of the lower extremities are greater in the Taytayan than in the European. Compared with the Normal Benguet Igorot, and the Igorot from Bontoc(3) (p. 452), the Taytayan is similar to both, and the protomorphic characters are evident in the long arms and the long total head height. According to Stratz (p. 204), the total head height varies with the stature, and a stature of 160 centimeters corresponds to a total head height of 23 centimeters. The stature of the Taytayans is 159.47 centimeters and the total head height is 23 centimeters.

HEAD FORM AND PHYSIOGNOMY.

The mean head length of 182 Taytayans is 18.30 centimeters and the mean head breadth is 14.96 centimeters with the resulting cephalic index of 81.79. This would be altered if the diameters of the head are reduced by 1 centimeter each as an allowance for the thickness of the extracranial tissues. The cephalic index of the skull would thereby be 80.7, a frankly brachycephalic skull, but very close to mesocephaly.

The cephalic index of the head is 4.19 points greater than that of the Igorots, and about as great as the greatest of Martin's Malays(18) (p. 344), which vary from 76.4 to 82.4.

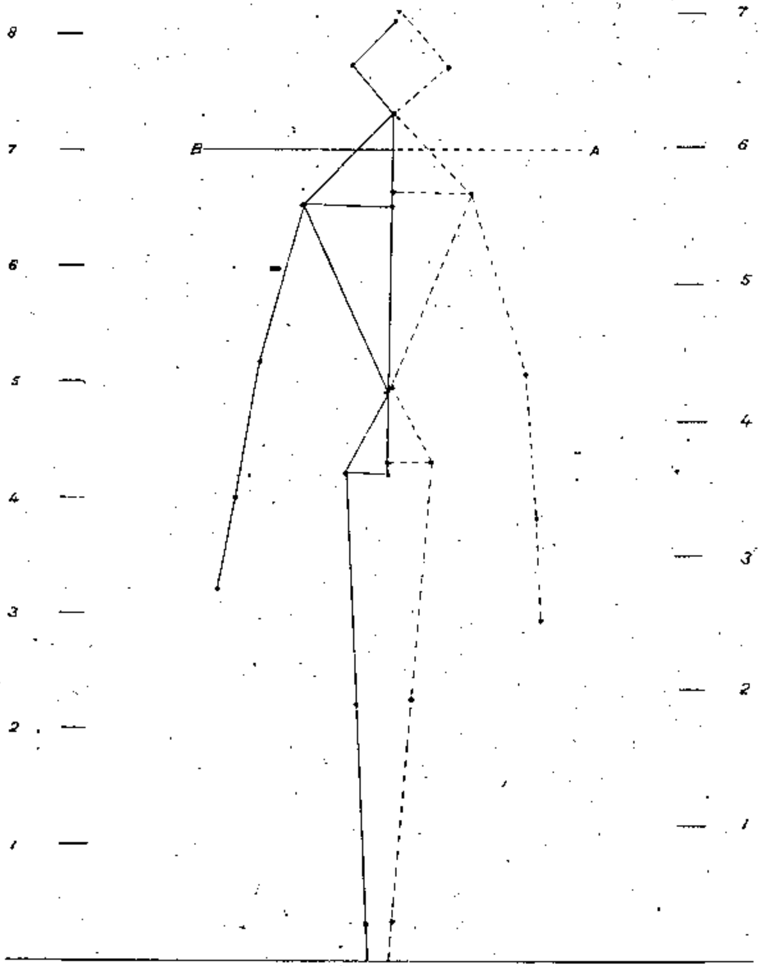

FIG. 4.—THE SOLID LINES ON THE LEFT REPRESENT THE AVERAGE EUROPEAN ACCORDING TO THE CANON OF FRITSCH. THE BROKEN LINES ON THE RIGHT REPRESENT THE AVERAGE TAYTAYAN ACCORDING TO THE SAME CANON. THE EUROPEAN STATURE IS EQUAL TO 8 TOTAL HEAD HEIGHTS. THE TAYTAYAN STATURE IS EQUAL TO 7 TOTAL HEAD HEIGHTS. A AND B POINT TO THE CHIN.

The narrowest forehead breadth is 45.2 millimeters less than the widest part of the head. This difference is only 43.0 millimeters for the Igorots and from 38 to 46 for the Malays(18) (p. 347).

The nose length, from the skin line at the greatest depression of the nose bridge between the eyes, to the nasal point or spine, is 4.7 centimeters, and the nose width from tip to tip of the flaring nostrils is 4 centimeters, with the resulting nasal index of 85.2. The Igorots have a nasal index of 92.7 measured in the same way. That of the Malays is only 82, because Martin used the nasion instead of the skin line.

The morphologic face index is 82.1, that of the Igorots is 79.4, whereas Martin's Malays vary from 80.5 to 85.8 which is greater than it would be were the methods of measuring the same.

The following facial indices are taken from Martin (18) for comparison:

Battaks	82.0
Javanese	82.1
Malays	83.0–83.8
South Chinese	85.3
Ainos	86.9
North Chinese	87.0
Sikhs	88.3

If the chin-nasion distance of the Taytayans were increased by 7 or 8 millimeters, which would be fair under the circumstances, the index would then surpass even that of the Sikhs. Undoubtedly, the face of the average Taytayan is long like that of the Sikh, the northern Chinese and the European.

The lower face height (chin to nasal spine 6.6 centimeters) compared with the upper face height (nasal spine to vertex, 16.4 centimeters) is not so great as that of the Igorots (6.7 centimeters lower, 14.9 centimeters upper) which again places the Taytayan close to the European.

TABLE I.—*Men of Taytay*—

Type of individual.	Serial No.	Clinical No.	Age.	Body.													
				Stature.	Sitting height.	Pubic height.	Umbilical height.	Sternal height.	Chin height.	Ear height.	Ankle height.	Knee height.	Trochanter height.	Finger tip.	Wrist height.	Elbow height.	Acromion hei
Australoid	1	8	18	162.4	85.2	----	----	----	----	----	----	----	----	----	----	----	----
Alpine	2	208	47	161.5	81.4	----	----	----	----	----	----	----	----	----	----	----	----
Cro-Magnon	3	360	27	166.0	87.5	----	----	----	----	----	----	----	----	----	----	----	----
Blend	4	370	29	151.4	82.6	----	----	----	----	----	----	----	----	----	----	----	----
Australoid	5	----	48	162.4	88.0	----	----	----	----	----	----	----	----	----	----	----	----
Blend	6	755	25	165.1	86.0	----	----	----	----	----	----	----	----	----	----	----	----
Blend	7	828	54	154.4	83.3	----	----	----	----	----	----	----	----	----	----	----	----
B. B. B	8	353	65	166.8	88.7	----	----	----	----	----	----	----	----	----	----	----	----
Australoid	9	390	45	162.2	89.9	----	----	----	----	----	----	----	----	----	----	----	----
Blend	10	398	30	168.2	90.7	84.0	101.0	136.0	144.5	153.4	6.3	45.3	86.0	62.0	80.3	105.2	137.0
Primitive Australoid	11	384	45	150.5	78.0	76.5	89.0	121.6	126.0	137.5	6.7	42.0	76.0	55.5	71.5	94.8	124.3
Blend	12	----	70	169.2	89.2	85.5	104.2	137.5	141.0	153.5	7.6	44.5	87.5	63.3	82.6	110.5	130.8
Blend	13	385	45	153.8	83.3	79.0	92.0	123.0	128.0	139.7	(?)	42.3	80.0	54.0	70.3	92.3	123.2
Blend	14	419	20	161.7	81.5	87.0	100.0	132.8	138.7	148.2	6.1	46.7	88.0	60.2	78.0	99.4	132.5
Blend	15	405	46	152.1	81.5	76.8	90.0	121.0	128.0	139.6	6.2	40.4	79.5	56.6	72.7	93.0	123.6
Blend	16	380	70	153.6	77.2	83.6	90.4	123.8	129.3	140.0	6.5	45.0	82.2	52.5	68.4	91.5	123.0
Australoid	17	390	41	163.2	89.9	81.5	95.0	132.5	140.5	151.0	7.4	43.0	79.2	60.5	77.3	103.0	131.5
Blend	18	376	23	152.7	82.0	69.0	88.0	121.0	127.3	138.2	7.6	42.3	75.5	51.0	68.8	89.9	118.4
Alpine	19	401	80	151.5	79.2	80.5	91.6	121.5	126.7	137.5	6.5	41.0	81.3	53.0	69.5	90.3	123.0
Blend	20	315	42	168.4	88.1	89.0	101.8	134.6	144.4	153.8	7.1	46.6	88.0	60.0	77.2	103.0	138.0
Australoid	21	158	41	159.4	84.5	83.5	94.5	129.0	134.6	146.3	7.0	40.0	83.0	56.0	73.0	98.0	128.3
Blend	22	373	70	160.8	83.5	82.8	97.6	131.2	138.0	147.0	7.5	45.2	84.9	58.8	77.5	102.4	132.0
B. B. B. ?	23	237	62	165.0	87.0	85.0	98.4	134.5	142.4	153.0	6.0	44.5	87.0	66.8	83.7	107.5	137.3
Primitive	24	303	25	147.1	78.8	73.0	85.5	119.3	127.0	135.0	6.3	37.0	76.2	53.0	68.7	90.0	119.0
Iberian	25	421	17	160.7	82.7	87.8	101.2	130.6	129.5	149.8	5.7	44.8	87.4	57.7	74.4	96.8	132.4
Blend	26	22	42	153.2	81.5	76.5	91.0	123.5	130.3	138.0	6.2	41.7	79.5	53.5	70.5	92.2	125.8
Australoid	27	238	30	163.4	86.8	85.7	97.8	131.8	138.6	148.8	7.4	45.6	86.3	59.7	77.8	100.0	130.8
Modified Primitive	28	----	29	158.9	86.5	78.3	93.3	128.4	135.5	146.0	7.0	43.5	81.0	59.7	77.7	99.4	130.0
Australoid	29	----	23	155.7	84.5	78.5	95.0	124.5	135.0	141.6	6.0	41.0	80.4	58.3	74.7	97.0	126.5
Blend	30	----	20	150.4	82.5	71.0	85.0	119.3	126.0	137.8	5.8	40.4	77.0	53.4	70.4	90.0	119.0
Primitive	31	432	39	158.6	82.1	78.7	91.8	125.6	132.4	141.4	6.7	41.4	80.0	53.0	70.2	95.5	124.5
Blend	32	438	50	159.3	82.3	85.4	96.5	129.8	137.3	145.3	6.2	44.0	85.3	60.0	77.0	100.0	132.0
Iberian	33	431	22	169.3	86.8	90.5	105.0	139.0	147.0	156.6	8.0	48.6	92.2	59.8	80.4	104.2	137.3
Australoid	34	----	32	160.1	85.5	82.8	96.0	129.0	137.2	146.0	7.0	44.9	83.4	58.0	76.2	98.0	130.8
Iberian	35	430	35	163.5	88.0	82.3	96.0	134.0	139.7	148.6	6.8	43.8	84.8	62.0	79.8	101.8	133.9
Adriatic?	36	----	17	164.5	86.2	84.5	100.0	134.0	140.0	149.4	6.7	44.8	87.6	60.0	76.7	96.5	130.5
Australoid	37	169	35	156.3	82.4	83.0	96.2	128.0	134.2	145.2	5.5	44.2	83.0	56.0	73.1	96.9	131.0
Blend	38	448	70	158.4	80.9	85.4	96.4	127.0	138.0	146.4	5.6	44.8	85.7	53.8	71.6	97.2	128.5
Australoid	39	----	19	157.1	83.5	80.0	94.6	128.0	135.8	144.2	5.1	43.2	82.4	55.0	73.0	96.7	127.0
Blend	40	----	24	156.1	83.3	78.7	94.8	127.4	134.0	143.8	6.4	43.7	81.8	55.7	73.3	93.7	124.8

absolute measurements, in centimeters.

Head.																									
Maximum—																					Circumference.				
Length.	Breadth.	Height.	Forehead width.	Bizygomatic.	Bimastoid.	Bigoniac.	Naso buccal.	Naso alveolar.	Nose base.	Nasion hair line.	Chin nasion.	Nose width.	Nose length.	Mouth width.	Mouth length.	Ear width.	Ear length.	Interocular distance.	Eye length.	Eye color.	Frontal.	Parietal.	Forehead.	Occipital.	Ear cartilage.
18.2	14.6	12.4	11.0	14.1	12.9	12.0	6.3	5.6	2.0	6.2	9.5	4.1	4.0	2.0	5.0	3.2	5.8	3.7	3.15	2.0	30.0	35.2	27.0	28.6	4.6
18.6	15.8	12.7	10.3	14.8	14.1	11.0	...	...	...	8.2	11.5	3.5	5.2	2.0	4.0	3.0	6.0	3.5	3.10	3.0	31.3	36.4	29.1	29.6	4.5
18.8	15.4	13.5	11.0	14.4	13.4	11.2	7.0	6.4	2.3	7.2	11.6	4.5	4.3	2.5	5.2	3.5	5.8	4.2	3.00	4.0	31.7	37.4	28.0	31.0	4.6
17.5	14.5	12.1	9.8	12.9	11.6	9.7	6.4	6.0	2.6	...	----	4.0	4.3	2.7	5.1	3.5	6.0	3.3	2.90	2.0	29.7	35.2	26.4	27.5	4.7
18.9	14.6	12.6	10.7	13.3	12.5	11.0	6.4	6.3	1.8	7.7	11.0	4.5	4.3	1.7	5.0	3.5	6.6	3.0	3.10	3.0	31.5	34.3	27.2	28.0	5.2
18.2	14.6	11.7	9.8	13.3	13.3	10.8	7.2	6.4	3.0	6.3	10.7	4.1	4.9	1.7	4.9	3.7	5.8	3.1	3.30	3.5	28.4	34.8	26.2	30.0	4.8
17.9	15.8	11.8	9.7	13.7	12.8	10.7	7.5	6.7	2.3	8.3	11.6	4.0	5.0	2.3	5.2	3.9	6.8	3.2	2.90	2.3	28.3	36.4	26.4	31.0	5.5
18.3	15.1	13.2	11.0	14.6	13.8	11.7	8.4	7.5	2.4	7.4	13.0	3.8	5.7	1.7	5.3	3.6	6.7	3.5	3.05	4	30.2	35.3	28.5	29.3	5.5
19.5	14.8	12.2	10.4	13.9	13.2	10.8	7.3	6.7	2.5	8.0	11.4	4.3	4.7	1.8	4.6	3.5	6.1	2.8	3.10	4	30.0	36.8	27.2	31.6	4.9
18.1	15.5	12.6	10.4	14.0	13.1	11.4	7.3	6.9	2.0	8.2	10.6	3.7	5.0	2.0	4.5	3.0	6.1	3.1	2.95	4	30.0	36.0	26.8	31.0	4.7
17.7	14.5	11.8	10.7	13.4	12.2	10.1	6.4	(?)	1.8	8.3	9.8	4.3	4.3	1.5	4.6	3.1	5.5	4.5	2.50	3	29.5	35.3	26.4	29.6	4.2
19.5	15.5	12.5	10.5	14.2	13.7	11.8	8.1	7.1	3.1	5.8	12.0	4.2	5.4	0.8	5.1	3.9	6.8	3.5	2.95	3.5	31.8	36.3	29.0	31.0	5.4
17.4	15.0	12.5	9.5	12.7	11.6	10.4	7.2	6.7	2.9	6.3	10.9	4.1	5.0	1.0	4.5	3.6	6.0	2.6	3.05	3.5	28.8	36.4	26.5	27.0	4.8
18.3	15.4	13.5	10.8	13.8	12.8	10.5	7.2	6.1	3.1	8.0	11.5	3.7	5.0	2.2	4.1	3.5	5.4	3.6	3.10	3	33.5	37.0	29.0	28.0	4.7
18.1	15.7	12.2	11.0	14.3	13.6	10.7	7.0	6.6	2.5	7.4	10.1	4.4	4.6	2.1	4.7	3.8	6.4	3.4	3.20	3	31.5	36.3	28.6	29.7	4.9
18.6	14.8	12.5	10.3	13.6	12.5	11.3	6.6	6.4	2.7	7.8	10.6	4.1	5.1	0.5	4.4	3.7	6.6	3.0	2.90	4	32.6	35.8	27.7	29.7	5.2
19.7	15.0	12.4	10.4	14.0	13.1	11.1	7.7	6.7	2.7	8.0	11.6	4.3	4.9	2.0	4.7	3.6	6.1	2.7	3.15	4.5	30.6	36.0	27.6	31.2	4.8
18.7	14.8	12.6	10.6	13.7	12.8	10.4	7.5	7.1	3.0	7.8	11.8	3.6	5.0	2.2	4.1	3.6	5.3	3.4	3.00	3	31.2	36.5	28.0	30.6	4.2
18.6	15.7	12.5	10.0	13.7	13.5	11.0	8.1	7.3	3.2	7.3	12.3	4.0	5.6	1.7	4.8	3.5	6.5	3.5	2.50	5	31.0	36.3	27.0	30.0	4.7
18.3	15.6	12.3	10.5	14.3	14.2	12.0	7.2	6.6	3.0	7.6	11.1	4.2	4.7	2.4	4.5	3.8	6.7	3.5	3.10	3.5	29.7	36.6	26.8	30.1	5.2
18.4	14.8	12.0	10.0	13.5	12.8	10.6	7.5	6.7	2.7	7.0	11.4	4.5	4.5	1.6	5.0	3.6	6.1	3.0	3.15	2.5	30.1	36.0	26.5	30.0	4.7
18.9	15.7	12.8	11.6	14.3	11.4	13.2	6.8	5.7	2.6	8.1	10.6	4.0	4.6	1.0	4.0	3.4	5.9	3.7	3.00	3	32.3	36.0	28.3	29.6	4.8
18.3	15.2	12.5	10.5	14.0	13.8	11.0	8.0	6.9	2.8	7.5	12.0	3.5	5.1	1.3	4.0	3.6	6.4	3.3	3.20	5	31.4	37.2	28.2	30.6	5.3
18.1	15.1	12.8	10.5	13.6	12.1	10.3	7.0	6.2	3.0	8.3	11.0	4.0	4.2	2.1	4.4	3.5	5.6	3.3	3.00	3	33.0	35.2	28.8	30.2	4.3
18.8	14.6	11.5	10.4	13.3	12.6	10.2	6.8	6.2	2.5	6.3	11.0	3.4	4.6	1.7	4.6	3.5	6.2	3.1	3.15	3	30.3	36.0	27.7	30.0	4.6
18.6	14.7	12.5	10.0	13.7	12.4	11.2	7.6	6.9	2.8	6.9	11.0	4.3	5.0	2.3	4.6	3.4	6.2	3.2	3.05	3	31.4	36.0	27.5	29.4	4.7
19.3	15.2	12.7	11.2	13.3	13.1	11.0	7.2	6.2	3.0	8.0	11.6	4.2	4.6	2.0	4.6	3.7	6.4	3.4	3.10	2	31.8	38.4	28.5	32.0	5.1
17.3	16.0	12.3	11.0	14.2	13.9	11.4	6.9	6.2	3.2	6.8	11.1	4.1	4.8	1.7	4.9	3.5	6.3	3.4	2.70	2.5	31.6	38.0	27.0	29.8	4.8
18.6	14.4	12.3	11.0	13.6	12.3	11.1	7.4	6.6	3.0	7.0	11.4	4.2	4.6	2.2	4.8	3.7	5.9	3.5	3.05	2.5	29.6	35.7	27.0	29.5	4.7
18.6	14.9	12.3	10.5	13.5	12.7	9.8	7.2	6.5	2.6	7.0	11.0	3.7	4.6	1.9	4.5	3.5	6.5	3.5	3.10	2	31.0	33.6	29.0	20.2	5.3
16.6	15.5	12.2	10.2	13.8	12.8	10.0	7.2	6.5	2.2	7.4	11.1	3.9	4.7	1.8	4.8	3.5	5.9	3.4	2.85	4	30.1	36.4	26.7	27.8	4.8
17.7	15.5	11.2	10.6	14.2	13.5	11.0	6.6	6.6	3.0	7.7	9.4	3.9	4.8	1.2	5.1	3.9	5.8	3.6	2.95	___	29.2	34.3	26.5	28.0	5.0
20.2	14.7	12.8	10.7	13.8	13.4	10.3	7.7	7.0	3.2	8.2	12.2	3.9	5.3	2.4	4.7	3.7	6.3	3.4	3.35	4	32.1	35.6	29.5	30.1	5.2
18.1	14.8	12.4	9.9	13.7	12.9	10.7	6.8	6.2	2.8	6.0	11.2	4.3	4.5	1.6	4.8	3.6	6.3	3.2	3.15	2	29.4	35.6	25.7	29.6	5.2
19.5	15.1	12.6	10.7	13.5	13.0	10.4	7.5	7.0	3.1	8.0	12.0	4.0	5.0	1.7	4.6	3.7	6.0	3.3	3.00	3.5	31.8	38.0	28.0	32.4	5.0
17.1	15.1	12.5	10.1	14.0	13.0	11.0	6.3	6.0	2.5	7.6	11.0	4.1	4.0	1.9	4.2	3.4	5.4	3.0	2.90	2	31.2	36.3	27.2	28.0	4.4
18.2	14.4	12.2	10.4	13.8	12.7	10.1	6.5	5.9	2.3	7.1	10.6	4.0	4.2	1.7	4.5	3.3	5.3	3.2	3.00	3	30.2	33.6	27.7	28.6	4.8
17.8	14.7	12.0	9.9	13.1	12.5	10.4	7.3	6.2	2.8	7.6	10.6	4.2	5.0	1.6	4.8	3.9	6.6	3.0	2.65	3	29.8	34.8	27.3	28.6	5.3
18.5	14.8	12.3	10.5	13.1	12.3	10.1	6.4	5.8	2.6	8.0	10.3	3.8	4.1	1.9	4.3	3.4	6.1	3.6	3.20	1	31.2	36.7	28.5	29.6	4.9
18.2	14.8	12.3	10.8	13.9	12.4	10.8	6.6	6.0	2.8	7.7	11.1	3.7	4.4	2.2	5.0	3.3	5.9	3.4	2.95	3.5	29.8	35.0	27.6	29.2	4.9

TABLE I.—*Men of Taytay*—

Type of individual.	Serial No.	Clinical No.	Age.	Body.													
				Stature.	Sitting height.	Pubic height.	Umbilical height.	Sternal height.	Chin height.	Ear height.	Ankle height.	Knee height.	Trochanter height.	Finger tip.	Wrist height.	Elbow height.	Acromion he
Blend	41	467	25	164.5	86.1	85.0	96.4	134.8	142.7	151.5	6.6	44.5	88.3	61.2	79.3	104.2	135.8
Blend	42	409	45	155.5	82.9	82.7	97.0	126.3	133.8	143.8	7.0	43.4	82.0	54.4	73.0	91.9	128.8
Iberian	43	-----	49	163.8	85.7	81.0	100.7	132.3	139.8	151.2	6.8	45.5	85.3	57.0	75.2	100.0	132.0
Australoid	44	395	50	155.3	82.5	78.6	88.7	127.3	133.4	141.5	7.5	44.0	79.8	53.4	72.6	97.0	127.2
Modified Primitive	45	1008	40	154.4	78.9	80.8	93.0	125.8	130.0	141.0	6.8	43.5	81.2	54.5	71.3	93.0	125.0
Blend	46	-----	22	152.0	81.7	75.2	90.0	123.0	129.5	139.8	6.0	39.0	77.0	52.0	70.0	92.2	123.2
Iberian	47	-----	35	154.5	85.9	76.6	89.3	123.5	132.5	141.3	6.2	40.6	77.0	55.0	71.3	95.7	123.5
Australoid	48	484	30	154.0	81.7	79.0	92.5	126.6	135.1	142.1	6.4	40.8	79.4	56.8	73.0	92.5	124.8
Blend	49	486	47	167.1	87.3	87.0	103.0	137.6	145.3	154.2	6.8	47.5	86.3	61.0	85.0	109.0	138.8
Iberian	50	17	66	158.4	82.3	81.5	95.5	128.6	131.5	143.4	6.3	44.0	84.0	53.0	71.0	95.5	128.0
Blend	51	465	30	157.5	83.7	81.6	94.3	128.5	135.0	143.0	5.8	41.5	82.2	57.4	74.1	95.1	128.5
Blend	52	-----	35	159.4	85.6	81.0	94.5	130.0	138.0	147.5	7.3	44.2	83.0	61.3	78.2	101.2	129.0
Cro-Magnon	53	360	35	170.7	88.8	92.0	106.0	139.8	147.3	158.5	7.2	48.2	95.3	61.2	81.5	105.8	138.7
Cro-Magnon	54	-----	35	166.8	84.7	86.3	101.0	136.2	142.8	153.0	6.9	47.0	87.0	61.0	80.5	103.8	137.5
Cro-Magnon	55	477	60	168.5	87.3	89.4	105.0	138.2	146.2	154.8	6.5	47.8	90.4	58.7	76.7	103.2	135.7
Blend	56	481	40	161.4	86.7	82.7	96.7	131.5	140.2	148.8	6.7	44.5	85.6	61.5	78.8	101.3	132.8
Blend	57	471	28	157.8	85.3	80.3	93.0	128.8	136.0	145.2	6.0	42.2	81.7	56.8	74.8	98.0	127.0
Blend	58	234	24	165.7	90.0	82.3	98.2	133.5	141.8	152.2	7.3	44.7	84.8	60.0	78.8	103.0	133.5
Blend	59	489	36	154.1	83.4	78.7	91.3	123.5	131.8	140.2	6.0	42.0	79.0	51.2	69.3	91.2	122.8
Blend	60	488	51	168.3	90.7	83.7	101.0	134.8	145.5	153.5	6.2	47.2	87.0	58.0	77.0	101.6	136.5
Blend	61	485	50	165.2	88.1	82.2	100.7	131.4	143.6	153.6	7.1	46.1	86.0	59.8	80.0	103.0	133.8
Blend	62	482	23	167.0	----	85.0	101.7	136.0	146.3	155.6	6.6	46.2	88.2	61.2	78.6	105.0	136.0
Alpine	63	492	40	164.3	85.8	86.0	100.0	132.4	139.5	148.5	6.5	43.3	85.7	58.4	77.0	99.4	133.0
Blend	64	466	43	161.0	85.3	81.6	95.8	128.8	138.8	147.4	6.3	44.5	84.2	57.2	75.0	98.6	130.0
Iberian	65	514	60	160.6	84.1	84.8	97.0	130.0	134.3	146.2	5.8	42.8	83.5	59.6	76.8	100.4	132.2
Iberian	66	501	23	164.0	86.5	84.0	96.5	133.8	141.0	150.2	6.6	45.7	85.7	56.3	75.2	97.8	130.4
Blend	67	988	80	157.1	82.2	83.2	95.2	126.5	135.0	144.4	7.1	42.5	82.8	55.4	72.5	93.7	127.3
Australoid	68	462	17	157.2	83.9	80.0	94.2	130.0	137.5	146.3	7.0	43.2	80.8	60.0	76.7	98.6	129.0
Blend	69	-----	40	167.3	86.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Blend	70	-----	27	155.2	83.7	78.0	90.3	124.2	131.8	141.0	6.5	40.6	79.5	56.8	74.6	94.2	125.6
Blend	71	505	49	159.4	84.7	82.8	96.0	130.2	138.7	147.6	6.2	44.0	85.4	55.9	74.3	95.7	127.8
Blend	72	526	28	151.8	80.3	76.8	90.2	121.2	129.2	139.0	5.8	42.7	78.7	54.0	68.0	90.8	123.0
Blend	73	-----	37	163.3	87.2	82.7	100.0	132.2	140.5	150.3	6.3	41.3	84.5	59.5	77.6	102.0	133.3
Cro-Magnon	74	535	19	169.7	90.1	89.0	105.5	137.5	144.3	156.4	6.5	44.6	91.2	57.2	77.6	104.3	137.4
Blend	75	521	32	168.7	88.9	85.8	100.7	136.2	145.0	154.6	7.4	46.4	87.7	64.8	81.6	104.7	137.0
Blend	76	528	28	157.0	82.0	83.2	96.3	126.7	136.0	145.3	7.0	42.8	83.6	59.5	76.5	98.0	127.0
Blend	77	503	50	156.5	82.2	80.3	94.0	127.3	134.7	143.8	6.0	43.5	83.2	60.5	77.2	99.4	129.5
Modified Primitive	78	836	23	157.0	84.3	78.2	90.0	123.5	131.0	141.2	5.7	42.0	79.0	53.6	69.9	91.5	124.6
Australoid	79	529	23	151.8	85.1	75.0	88.0	121.4	130.0	140.0	6.7	42.4	75.7	57.6	74.0	95.7	125.0
Iberian	80	522	40	157.4	86.0	78.7	93.2	126.4	132.2	143.5	6.7	40.0	80.8	55.4	73.5	96.2	126.7

absolute measurements, in centimeters—Continued.

Head.																									
Maximum—																					Circumference.				
Length.	Breadth.	Height.	Forehead width.	Bizygomatic.	Bimastoid.	Bigoniac.	Naso buccal.	Naso alveolar.	Nose base.	Nasion hair line.	Chin nasion.	Nose width.	Nose length.	Mouth width.	Mouth length.	Ear width.	Ear length.	Interocular distance.	Eye length.	Eye color.	Frontal.	Parietal.	Forehead.	Occipital.	Ear cartilage.
18.2	14.8	11.8	10.5	14.0	13.3	11.0	7.1	6.3	3.0	6.8	11.2	4.0	5.2	2.2	4.7	3.5	6.0	3.7	3.05	1	29.0	36.5	27.0	29.5	4.8
18.1	14.4	11.4	10.5	13.6	12.6	10.5	7.8	7.0	2.3	8.2	11.2	4.0	5.2	1.2	4.2	3.8	6.0	3.7	3.10	3.5	29.0	33.8	27.6	28.2	5.2
18.0	14.1	11.7	10.7	13.8	12.7	11.4	7.0	7.5	3.1	6.9	11.8	3.9	4.8	2.0	4.9	3.6	7.0	3.5	2.70	1	30.5	33.7	28.0	28.2	5.0
18.0	14.2	12.7	10.2	14.4	12.9	11.5	7.1	6.2	2.6	6.2	10.4	4.2	4.3	1.4	4.7	3.7	7.1	3.4	2.75	4	29.4	31.2	27.2	29.0	5.7
17.1	15.5	12.2	10.3	13.4	12.8	10.7	7.0	6.7	3.1	7.8	11.0	4.2	4.5	2.0	5.2	3.3	5.3	3.3	2.90	4	30.6	32.7	27.1	28.0	4.7
17.6	15.2	12.5	11.2	13.3	12.7	10.5	7.0	6.1	2.7	6.4	11.3	4.0	4.3	2.4	4.4	3.4	5.3	3.7	2.80	2	32.3	35.8	27.6	26.7	4.5
19.3	14.7	12.3	11.0	14.5	13.2	11.0	7.0	6.0	3.6	7.0	10.6	3.7	5.1	0.8	4.4	3.6	5.9	4.0	2.90	4.5	31.2	35.6	29.0	30.5	5.0
17.8	14.2	11.3	9.8	13.1	11.6	10.2	7.3	5.6	2.8	7.9	9.3	4.0	4.3	1.0	4.5	3.6	6.1	3.5	2.65	2.5	28.5	31.8	26.4	27.3	4.9
18.0	15.8	12.6	10.8	13.9	13.9	10.6	7.3	6.4	2.7	7.4	11.1	4.1	4.6	1.0	5.4	4.0	6.6	3.6	2.75	4	29.8	37.5	26.7	29.7	5.5
18.7	14.7	12.7	10.4	14.0	13.0	10.0	7.3	6.7	2.8	7.0	12.0	3.9	4.9	2.0	4.7	4.0	6.6	3.4	3.00	4	31.0	35.5	27.8	28.7	5.5
17.7	15.3	12.6	10.5	14.0	12.7	10.6	6.2	5.6	2.5	7.5	10.3	3.5	3.8	2.1	4.1	3.6	5.0	3.4	2.90	3	32.0	35.8	26.8	28.5	4.4
18.4	15.6	12.5	10.0	14.1	13.2	11.1	8.1	7.5	3.0	6.9	12.7	4.6	5.2	2.8	5.2	3.4	6.4	3.8	3.10	3.5	31.3	36.8	28.7	29.4	5.0
18.5	14.3	12.0	10.3	13.2	13.6	10.8	7.1	6.6	2.9	6.5	11.8	3.7	4.5	2.0	4.3	3.6	6.2	2.8	3.30	5	29.6	35.6	26.2	28.1	5.2
18.8	15.0	12.5	10.1	14.8	13.0	11.4	7.5	6.8	3.3	7.8	12.0	4.4	4.4	1.8	5.0	3.8	6.2	4.0	3.10	1	32.0	35.5	29.2	27.7	5.3
18.1	15.0	12.7	10.0	13.8	13.0	10.1	7.1	6.4	2.9	6.8	12.0	4.1	4.3	2.2	4.4	4.1	6.1	3.4	2.95	4	30.6	35.8	28.2	28.0	5.4
18.0	15.0	12.2	10.0	13.2	12.4	10.8	6.5	5.8	2.6	6.6	10.4	4.0	4.3	2.0	4.2	3.6	6.1	2.9	3.05	2	28.3	36.1	25.8	28.2	5.2
18.4	15.3	11.7	10.1	13.0	13.0	9.1	7.6	6.3	2.7	6.1	12.0	4.1	4.7	2.0	4.5	3.5	5.8	3.2	3.00	2.5	29.3	35.7	27.2	28.3	5.0
18.1	15.8	12.4	10.5	13.7	12.8	11.1	7.8	6.9	3.1	8.0	12.2	4.1	5.1	2.5	4.5	4.0	6.1	3.1	3.30	1	31.5	38.2	28.3	29.0	5.2
17.7	15.7	11.8	10.2	13.4	12.7	10.4	7.1	6.3	2.4	7.6	10.9	4.5	4.5	1.4	4.6	3.3	6.6	2.8	3.10	1	30.0	36.8	26.5	27.0	5.0
19.5	15.9	12.3	10.8	15.0	14.3	12.0	8.0	6.3	2.8	8.0	11.4	4.5	5.0	2.3	5.0	3.7	7.3	3.4	3.15	3.5	31.4	36.6	29.1	29.7	5.9
18.9	15.0	12.3	11.0	14.8	13.4	11.7	7.1	6.0	2.8	8.2	11.2	4.3	5.1	0.8	5.7	3.5	6.1	3.5	3.05	2	31.2	35.2	28.3	28.4	4.8
17.7	15.1	12.4	11.4	14.2	13.2	11.1	6.3	6.2	2.3	8.2	10.5	3.7	4.4	1.9	4.6	3.1	5.5	3.5	3.30	4.5	31.2	34.6	28.3	25.8	4.7
17.5	14.9	12.6	11.0	14.8	13.2	10.1	7.0	6.9	2.8	7.7	11.3	3.3	5.0	1.4	5.0	3.5	6.6	3.0	3.15	4	32.0	34.4	27.5	28.6	5.3
18.9	15.2	12.5	11.0	13.6	12.6	10.6	7.6	6.8	2.4	7.5	11.8	4.2	5.0	1.0	4.6	3.6	5.7	3.4	3.05	2	31.8	36.0	28.2	30.0	5.0
18.5	14.1	11.9	10.2	13.6	13.0	9.7	7.0	5.6	3.3	8.6	11.3	3.7	4.7	1.8	4.6	3.5	6.5	3.4	2.95	4	30.6	34.4	27.0	29.0	5.1
19.8	15.3	12.5	11.1	14.2	13.6	10.5	7.2	6.6	2.6	9.0	11.5	4.1	4.8	2.8	4.6	3.5	6.0	3.7	3.10	1.5	31.3	37.0	28.2	30.0	4.8
17.3	14.8	12.0	10.6	13.9	12.9	10.9	6.9	6.3	2.6	6.4	9.9	4.0	4.6	0.5	5.0	3.9	6.7	2.8	3.10	4?	30.0	35.1	27.8	26.7	5.5
17.8	13.9	11.8	10.0	13.0	11.7	9.7	5.9	5.3	2.5	6.7	9.5	3.8	3.8	2.2	4.3	3.9	5.3	3.2	2.90	2.5	28.0	34.4	24.7	29.0	4.5
18.8	15.1	12.2	10.8	14.3	12.8	11.3	8.0	7.1	2.6	7.8	12.0	4.5	5.2	2.1	5.0	3.8	6.5	3.4	3.40	4	31.8	36.2	27.8	30.7	5.3
19.2	15.3	12.4	10.8	13.3	12.7	11.1	7.5	6.5	2.8	7.3	11.6	4.1	5.0	1.8	5.2	3.6	5.8	3.4	2.90	1	30.1	37.4	26.5	30.0	4.6
17.8	15.1	12.4	10.0	12.8	12.3	10.0	7.2	6.2	3.2	7.7	11.4	4.2	5.1	2.0	4.8	3.3	6.4	3.1	2.85	2	30.0	36.8	26.7	28.7	5.1
16.6	14.3	11.7	10.1	13.4	12.4	10.2	6.4	5.9	2.3	---	----	3.7	4.3	1.6	4.1	3.7	7.0	3.3	3.15	3	28.4	33.2	25.8	27.0	5.3
19.1	15.3	12.2	10.3	13.8	13.4	10.4	6.9	6.2	3.1	6.5	113	3.9	4.7	2.2	5.0	3.5	6.0	3.0	2.10	5	29.0	37.3	27.0	30.2	4.9
19.3	14.7	13.6	11.1	14.2	13.2	11.4	7.4	7.3	3.0	8.6	12.5	4.1	4.6	2.7	5.0	3.8	5.9	3.7	3.40	3	31.3	37.2	28.2	29.6	5.1
18.8	16.0	13.3	11.0	15.0	14.7	12.4	7.3	6.8	2.7	6.6	12.0	4.3	5.0	1.8	4.5	3.7	5.9	3.4	3.10	4.5	31.0	36.8	28.5	29.5	5.1
18.3	15.0	12.4	9.6	14.1	13.5	10.5	7.0	6.5	2.5	7.6	11.2	3.4	4.7	1.7	4.8	3.6	6.5	3.0	3.00	4	30.0	36.2	27.5	28.5	5.4
17.5	14.3	12.3	10.3	13.8	12.9	9.8	6.5	5.4	3.1	6.8	10.7	3.8	5.0	1.1	5.0	3.8	5.6	4.0	2.60	2	30.1	34.4	28.2	26.3	4.9
17.5	15.6	12.7	11.0	14.0	13.0	10.6	6.6	5.8	2.7	7.8	11.0	3.8	4.0	2.6	4.5	3.4	5.7	3.9	2.75	3	30.7	36.7	28.0	26.6	4.6
18.7	14.3	12.0	10.2	12.9	12.3	10.2	6.9	6.7	3.1	7.0	12.0	4.1	4.8	2.5	5.1	3.4	6.4	3.4	2.95	1	30.2	36.0	27.2	29.0	4.9
20.0	14.1	12.5	10.2	14.2	13.5	10.4	6.9	6.0	3.2	9.0	11.5	3.8	4.8	1.7	4.7	3.9	6.6	3.2	2.75	3	30.6	33.7	28.8	29.0	5.3

TABLE I.—*Men of Taytay*—

Type of individual.	Serial No.	Clinical No.	Age.	Body.													
				Stature.	Sitting height.	Pubic height.	Umbilical height.	Sternal height.	Chin height.	Ear height.	Ankle height.	Knee height.	Trochanter height.	Finger tip.	Wrist height.	Elbow height.	Acromion he
Iberian	81	520	40	160.3	86.3	80.7	95.5	128.6	135.7	146.8	7.5	45.2	82.5	60.8	77.4	99.1	132.0
Blend	82	537	45	161.6	85.3	82.4	99.0	133.5	131.0?	148.2	6.0	44.7	83.7	59.4	77.8	100.5	133.4
Blend	83	225	30	160.4	83.3	83.2	98.0	131.0	137.0	148.5	5.7	42.3	86.2	61.3	77.5	100.8	131.2
Iberian	84	703	50	156.0	83.8	78.5	95.0	126.6	133.4	144.2	7.5	41.0	81.8	57.3	77.5	98.4	129.0
Australoid	85	-----	31	162.5	86.2	84.4	97.4	130.5	139.0	148.4	6.8	45.8	83.3	61.8	78.4	99.2	132.2
Australoid	86	566	32	159.2	85.0	80.4	95.0	130.5	(?)	(?)	6.2	43.8	83.0	57.2	74.0	97.7	129.6
Modified Primitive	87	-----	17	156.0	80.8	81.4	96.2	127.6	134.5	142.6	6.8	44.8	83.2	51.0	71.8	95.4	127.5
Alpine	88	180	27	157.0	84.0	81.4	95.5	129.2	135.8	145.6	7.0	44.5	83.3	53.8	72.0	96.6	128.6
Australoid	89	564	55	156.8	84.5	81.2	95.5	125.7	134.6	142.5	6.7	44.0	80.1	54.0	73.4	95.0	124.6
Cro-Magnon	90	560	40	170.2	88.2	90.5	105.6	139.8	148.8	158.3	7.1	49.3	91.7	59.2	80.7	103.2	138.7
Blend	91	551	23	150.8	80.2	78.7	92.0	122.3	129.0	138.4	6.4	40.2	78.1	50.0	67.7	90.4	123.5
Blend	92	556	30	152.2	79.5	79.7	92.2	123.3	129.5	139.7	6.3	40.2	79.8	55.0	72.8	93.8	124.4
Blend	93	558	23	162.2	83.3	86.5	97.8	131.0	138.5	148.8	7.1	45.0	86.4	57.0	75.7	99.4	129.8
Blend	94	474	40	148.5	80.0	72.4	86.0	118.0	125.4	136.5	6.0	38.4	74.0	53.8	70.2	90.6	119.0
Australoid	95	580	39	157.8	84.8	79.0	94.0	128.3	135.3	144.6	6.8	43.8	82.8	59.0	75.4	96.6	128.0
Australoid	96	-----	45	160.9	88.3	79.2	96.0	130.3	136.3	146.2	6.8	44.4	80.0	61.0	78.8	100.7	131.4
Blend	97	581	40	163.7	87.7	83.5	99.3	130.0	140.5	151.0	6.8	44.7	84.5	55.0	73.0	98.0	130.0
Australoid	98	-----	(?)	157.5	85.5	77.0	94.4	126.0	133.8	145.7	7.0	42.8	81.0	56.1	73.0	94.5	126.6
Australoid	99	176	25	156.8	81.0	82.0	95.2	128.8	137.0	145.3	6.3	43.6	83.2	56.8	75.5	98.5	131.4
Blend	100	584	66	155.7	82.6	80.7	93.5	125.2	133.0	143.0	6.5	43.0	80.3	56.0	74.6	96.2	126.7
Blend	101	596	37	162.5	87.8	82.4	96.5	131.3	140.2	149.8	6.5	45.8	83.8	60.7	78.0	100.0	131.0
Blend	102	589	22	164.3	85.1	86.0	101.0	134.0	141.5	151.7	6.7	44.8	87.0	57.2	76.0	102.5	137.0
Cro-Magnon	103	616	37	167.0	86.8	87.2	100.7	131.5	141.6	153.2	6.1	46.7	87.3	61.0	80.5	105.0	136.6
Blend	104	63	16	156.8	80.7	79.6	95.2	125.5	133.2	141.8	6.2	41.0	81.3	56.0	72.3	93.0	126.0
Blend	105	603	50	155.9	83.2	78.4	94.5	125.5	132.5	142.5	6.8	43.8	82.0	54.0	71.8	91.0	126.0
Blend	106	-----	22	159.7	-----	82.5	96.7	129.5	138.8	146.5	6.1	45.2	85.0	57.2	75.5	98.3	130.5
Blend	107	104	28	152.8	81.8	78.5	92.2	125.5	131.4	141.8	5.4	42.6	80.3	54.8	72.0	92.5	124.5
Blend	108	-----	32	159.5	74.3	84.0	96.4	127.0	135.4	145.5	6.6	45.5	85.0	58.2	76.4	99.0	128.5
Alpine	109	653	33	162.3	84.2	85.2	99.4	130.8	139.3	148.8	6.7	45.6	84.5	58.2	76.0	98.7	132.5
Primitive	110	-----	28	149.8	83.0	75.2	91.2	119.5	126.5?	136.8	6.2	41.7	72.8	54.0	69.4	90.0	120.3
Blend	111	638	28	159.3	84.4	82.2	97.2	128.0	134.7	145.5	6.1	45.5	83.8	58.5	75.5	99.4	128.5
Blend	112	-----	15	151.6	78.9	78.2	91.2	123.5	129.0	138.7	5.4	42.7	78.8	55.3	72.6	92.5	121.5
Australoid	113	628	35	155.3	84.2	77.6	89.8	126.0	132.8	142.0	6.3	42.8	80.0	54.7	73.0	94.8	125.0
Cro-Magnon	114	656	21	166.8	84.5	90.4	104.0	136.0	143.4	152.5	6.7	48.0	90.5	56.8	77.0	100.5	135.0
Blend	115	639	20	157.1	87.8	78.3	95.6	126.8	134.3	144.3	7.1	41.6	78.1	59.3	75.7	98.3	128.0
Blend	116	631	15	146.9	77.2	77.2	89.8	119.8	126.0	134.6	4.4	39.5	77.5	52.5	67.2	88.0	118.2
Blend	117	-----	47	162.4	85.7	84.2	98.0	131.0	139.0	149.0	5.7	45.5	84.4	58.0	76.8	99.0	131.8
Blend	118	316	27	163.0	86.5	87.2	101.4	133.0	141.8	152.0	6.2	46.0	86.2	58.6	75.3	100.0	130.0
Iberian	119	-----	30	156.4	81.2	81.8	97.0	128.5	131.0	144.2	6.3	45.4	83.2	56.6	74.4	97.7	128.3
Blend	120	654	42	153.2	80.3	79.0	92.7	122.8	130.5	139.8	6.3	42.6	81.0	53.2	70.4	95.3	123.4

absolute measurements, in centimeters—Continued.

Head.																									
Maximum—																					Circumference.				
Length.	Breadth.	Height.	Forehead width.	Bizygomatic.	Bimastoid.	Bigoniac.	Naso buccal.	Naso alveolar.	Nose base.	Nasion hair line.	Chin nasion.	Nose width.	Nose length.	Mouth width.	Mouth length.	Ear width.	Ear length.	Interocular distance.	Eye length.	Eye color.	Frontal.	Parietal.	Forehead.	Occipital.	Ear cartilage.
18.8	14.1	12.0	10.4	13.8	14.0	10.5	7.2	6.6	3.4	7.3	11.0	4.0	5.1	1.5	5.0	3.6	7.1	3.6	2.70	4	28.6	31.2	25.5	28.8	5.9
18.4	15.5	12.2	10.6	13.7	13.8	10.5	8.5	7.6	3.2	7.1	12.5	4.0	5.3	1.5	5.0	3.4	7.6	3.0	3.10	2	29.4	37.6	26.8	31.0	5.5
18.1	14.5	12.5	10.2	13.6	12.7	11.0	7.3	6.6	3.2	7.2	12.1	3.8	4.3	2.5	4.5	3.5	6.0	3.4	2.95	3	30.6	35.4	27.0	27.8	5.1
18.3	14.2	12.2	10.6	13.6	12.8	10.9	7.4	6.3	2.8	6.3	12.3	4.0	4.9	2.3	4.7	3.3	6.7	3.4	2.95	3.5	30.0	34.6	28.2	28.0	5.2
19.7	15.0	13.1	11.1	13.6	13.2	11.6	7.7	6.8	3.1	8.2	12.5	4.5	4.8	2.3	4.1	3.5	6.3	3.2	2.80	3	30.6	37.0	29.0	30.2	4.9
18.8	14.4	12.3	11.0	13.9	13.2	10.4	6.7	6.1	2.3	5.8	10.7	4.4	4.0	2.7	5.1	3.5	5.9	3.9	3.05	1	30.4	35.7	27.3	28.0	5.1
16.6	14.8	12.0	10.0	13.0	12.0	10.4	6.7	5.7	2.5	----	----	3.8	4.5	2.5	4.5	3.5	6.1	3.3	2.75	3	29.8	31.2	25.0	27.3	4.6
17.5	15.2	12.0	11.0	14.0	13.1	10.6	7.8	6.7	3.0	7.7	12.0	3.8	5.1	1.9	4.0	3.6	6.5	3.4	3.05	2	32.1	35.0	27.3	26.6	5.6
19.0	14.0	12.5	10.0	14.1	13.0	10.2	7.2	5.8	2.3	6.0	10.6	4.6	4.5	1.8	----	3.6	6.2	3.5	3.10	3	29.6	31.6	27.0	29.0	5.2
18.2	14.3	12.4	10.2	13.1	13.6	10.8	7.1	6.6	3.2	6.7	11.3	3.6	4.4	2.8	4.8	3.8	6.3	3.1	3.15	4	28.4	35.5	26.8	28.5	5.2
18.0	15.3	11.7	9.8	13.2	12.3	10.2	6.4	5.8	2.9	7.4	10.0	3.7	4.2	2.0	4.4	3.8	5.2	3.1	2.75	5	28.7	35.1	27.0	27.6	4.4
17.0	14.5	11.7	10.5	13.5	12.7	10.0	7.0	6.6	3.3	8.4	11.0	4.0	4.8	1.8	5.3	3.2	5.1	3.1	3.10	3	30.0	32.1	27.2	25.3	4.6
17.5	14.6	12.0	10.6	13.8	12.7	10.1	7.0	6.5	2.6	6.0	11.3	3.8	4.8	2.1	4.0	3.3	5.9	3.8	2.85	3	30.2	35.0	27.6	27.1	4.6
17.7	14.7	11.7	10.0	13.5	12.6	10.3	7.3	6.6	2.8	7.4	11.0	4.1	5.1	2.2	5.0	3.5	6.4	3.1	3.10	3	29.0	35.0	25.3	28.0	5.0
18.7	14.4	12.3	10.6	13.5	12.6	9.6	6.5	5.7	3.0	7.9	11.0	4.0	4.2	----	----	3.7	6.3	3.7	2.95	4	31.1	31.0	28.4	28.2	5.2
18.6	15.2	13.3	10.8	13.8	12.8	10.2	7.1	6.6	3.0	8.6	11.8	4.1	4.2	2.0	4.6	3.9	5.9	4.9	2.65	(a)	31.8	36.1	27.2	29.5	5.0
18.7	15.2	12.0	11.2	14.3	13.3	12.0	7.2	6.6	2.5	7.0	11.9	4.3	4.7	2.0	4.4	3.3	6.1	3.5	3.20	2	31.2	36.3	28.5	29.5	4.6
18.4	15.2	12.9	10.8	14.0	13.1	10.3	7.0	6.1	2.2	7.0	11.3	4.2	4.3	2.2	5.0	3.5	6.2	3.7	2.90	2	30.3	36.4	27.0	29.4	4.8
18.4	15.0	11.2	10.1	13.6	12.7	10.3	6.9	6.1	2.6	6.6	11.1	4.1	4.3	2.8	4.7	3.3	5.6	3.5	3.00	4	29.6	35.3	27.5	27.8	5.0
18.7	14.9	12.7	9.3	13.7	12.9	10.6	7.8	6.6	3.1	8.1	11.4	3.9	4.8	2.5	4.6	3.7	7.0	3.2	2.90	3	30.6	36.4	26.8	29.6	5
18.8	16.0	12.6	11.2	14.3	13.3	11.3	7.2	6.6	3.2	6.3	11.3	4.4	4.9	1.4	5.3	3.6	6.1	3.8	2.75	5	32.0	37.2	28.6	29.6	5.4
18.0	15.1	12.3	10.0	13.8	13.1	10.6	7.0	6.4	2.8	6.7	11.0	3.7	4.8	2.3	4.7	3.4	6.0	3.0	3.10	1	31.2	36.4	28.8	28.0	5.1
19.4	14.7	13.0	10.1	14.0	13.0	11.1	6.9	6.4	2.7	7.4	11.7	4.1	4.2	2.0	4.8	3.6	6.3	3.3	2.85	2	31.6	35.3	27.7	29.0	4.8
18.7	14.8	12.2	10.4	13.7	12.6	10.4	6.7	5.8	2.8	7.5	11.0	3.7	4.2	2.6	4.2	3.7	5.2	3.5	2.80	3	29.4	35.7	28.0	28.5	4.6
18.8	15.8	13.2	10.8	13.8	13.2	11.1	7.6	6.3	2.8	8.0	11.6	4.3	5.0	1.5	5.2	3.5	6.1	3.1	3.05	3.5	32.0	38.3	29.7	27.7	4.9
17.8	14.8	12.8	10.1	13.5	12.1	10.6	6.8	6.1	2.7	----	----	3.4	4.6	1.9	4.0	3.8	5.8	3.2	2.80	3.5	29.5	35.6	27.8	26.8	4.8
17.6	14.8	12.0	10.5	13.7	12.1	10.0	6.8	6.1	3.0	7.0	10.7	3.8	4.3	2.2	4.5	3.3	5.8	3.4	2.85	3.5	30.2	35.5	26.0	26.0	4.5
18.6	15.7	11.8	10.4	13.8	12.7	10.3	7.5	7.0	2.8	8.5	11.9	4.0	4.8	2.8	4.7	3.6	6.0	3.3	3.10	3	30.4	37.2	28.3	27.8	5.1
17.5	16.5	11.8	11.0	14.7	13.5	10.1	7.6	7.1	2.7	8.0	11.1	3.2	5.3	2.7	4.5	3.4	5.8	2.7	3.20	5	31.0	37.5	27.0	28.5	4.9
17.2	15.3	13.0	10.7	14.4	13.3	11.1	7.0	6.1	3.0	7.2	10.7	4.1	4.6	1.6	4.7	3.6	6.3	3.4	2.80	3	31.2	35.4	27.8	27.0	4.8
18.2	15.0	13.1	10.5	13.8	13.0	10.5	7.2	6.6	2.8	6.8	11.8	4.0	4.6	2.2	4.4	3.2	6.3	3.5	3.00	3	31.2	35.8	27.3	28.0	4.6
18.2	14.2	13.0	10.3	13.1	12.9	10.1	6.5	5.3	2.5	7.1	10.5	3.8	4.4	2.2	4.5	3.6	6.0	3.1	2.95	3	30.0	35.3	26.8	29.3	4.9
18.3	14.7	13.0	10.6	13.8	13.5	10.2	7.3	6.3	2.8	----	----	4.2	4.4	2.2	4.2	3.4	5.9	3.1	3.25	4	30.0	35.8	28.0	28.2	4.8
19.3	14.5	12.7	10.3	13.5	13.4	11.2	6.8	6.2	3.0	8.9	11.3	4.5	4.5	2.4	4.7	3.3	5.9	4.0	2.70	4.5	30.0	35.2	28.0	29.6	4.5
18.1	14.8	12.5	10.3	13.6	12.5	10.2	6.8	5.9	2.6	7.7	10.3	3.7	4.6	1.8	4.5	3.0	5.7	2.9	2.85	3	29.8	35.6	27.2	28.6	4.7
17.0	14.9	12.0	10.1	13.0	12.0	10.2	7.0	6.5	2.6	5.5	11.1	3.6	4.5	2.4	4.2	3.4	5.5	3.5	2.85	2	29.2	31.8	26.0	27.0	4.3
18.0	15.1	12.5	10.5	13.5	13.3	9.8	7.8	7.5	3.4	6.3	12.5	4.3	5.4	2.1	5.2	3.8	6.3	3.4	3.05	3	30.0	34.8	28.0	27.6	5.0
17.8	15.4	12.5	10.2	14.0	14.0	10.5	6.6	6.3	2.7	6.7	11.0	3.6	4.4	2.4	4.6	3.0	5.6	3.8	2.80	3	31.0	36.5	27.4	28.2	4.6
17.7	13.8	12.4	10.0	13.2	12.4	10.6	7.6	7.3	3.2	7.0	12.1	3.6	5.0	2.7	5.0	3.3	5.5	3.0	3.00	3	28.1	34.6	25.4	27.5	4.8
18.9	15.4	12.9	11.0	14.2	13.4	10.4	7.6	6.7	3.2	8.3	12.1	3.9	5.3	2.2	5.2	3.6	6.8	3.9	2.85	4.5	31.8	36.3	28.2	29.0	5.5

[a] Blind.

TABLE 1.—*Men of Taytay—*

Type of individual.	Serial No.	Clinical No.	Age.	Body.													
				Stature.	Sitting height.	Pubic height.	Umbilical height.	Sternal height.	Chin height.	Ear height.	Ankle height.	Knee height.	Trochanter height.	Finger tip.	Wrist height.	Elbow height.	Acromion h
Blend	121	662	34	164.7	83.2	87.3	100.6	134.5	142.8	153.0	7.0	47.4	89.7	54.3	73.6	100.3	134.0
Modified Primitive	122	657	29	161.2	89.9	80.3	96.4	130.4	138.0	148.3	6.0	43.5	80.0	53.5	72.6	97.6	129.5
Blend	123	651	62	163.5	84.3	81.2	100.0	132.5	140.0	149.0	6.5	45.6	87.3	59.4	77.0	101.0	132.5
Australoid	124	650	42	156.0	86.1	77.8	92.2	125.4	132.3	142.6	6.7	42.5	80.0	57.0	73.0	94.4	124.0
Blend	125	609	17	164.5	87.9	86.4	101.5	135.5	141.8	152.3	7.8	41.8	85.0	57.3	75.5	100.7	134.4
Blend	126	692	64	166.5	85.2	87.8	101.5	131.8	141.0	152.0	6.4	46.5	89.0	57.8	76.8	102.5	135.0
Australoid?	127	-----	30	153.5	80.5	80.4	95.8	123.5	132.0	140.0	6.1	44.0	79.0	57.7	72.5	94.0	125.5
Blend	128	708	70	158.7	81.2	82.3	96.7	130.0	137.5	145.5	7.1	45.0	84.0	55.3	72.6	96.0	127.5
Australoid	129	686	35	155.7	82.3	80.3	93.8	126.0	131.5	143.0	6.1	42.0	82.0	56.0	71.8	95.0	126.0
Cro-Magnon	130	710	28	167.7	88.9	85.4	100.0	135.3	145.0	154.6	6.4	46.8	86.8	64.5	82.5	106.0	138.0
Alpine	131	730	25	157.9	84.5	80.2	93.3	129.0	137.2	147.2	6.0	43.8	80.6	56.4	73.6	95.5	128.0
Blend	132	754	16	156.5	81.7	79.0	93.0	125.5	133.5	143.0	6.1	43.3	82.8	53.4	71.0	92.7	126.0
Blend	133	726	16	160.0	80.7	86.5	98.0	130.5	136.8	146.7	6.8	46.0	86.0	55.8	73.8	97.2	129.8
Blend	134	757	19	168.6	89.5	88.0	102.5	137.8	144.4	153.8	7.7	48.6	89.8	56.3	74.6	102.0	135.0
Australoid	135	758	63	161.6	86.7	81.5	97.5	131.7	138.0	150.0	6.0	44.3	84.2	56.5	74.6	97.8	133.2
Australoid	136	760	27	149.5	78.5	77.5	90.5	119.0	126.7	134.2	5.8	41.4	77.2	50.2	65.0	87.6	119.5
Blend	137	761	38	145.7	78.1	76.2	86.3	118.5	124.0	132.6	7.3	40.7	77.0	52.8	71.0	89.6	118.0
Iberian	138	756	20	158.3	80.8	83.4	98.3	130.0	138.5	148.7	6.5	45.2	84.0	56.0	74.0	96.8	128.8
Blend	139	-----	26	156.6	87.0	77.0	91.3	127.0	135.5	144.5	6.3	40.6	77.5	55.5	71.0	94.3	126.8
Australoid	140	-----	19	161.0	84.6	85.0	96.5	128.5	137.3	146.8	6.6	47.0	85.7	54.2	72.4	94.0	128.0
Iberian	141	-----	45	166.2	86.7	86.5	100.0	135.3	143.5	153.0	6.7	45.5	86.0	62.0	79.4	103.5	136.5
Australoid	142	784	70	164.0	86.7	83.0	94.0	131.4	139.0	149.8	6.6	46.5	86.2	59.5	79.0	104.5	135.5
Australoid	143	775	30	159.8	84.0	83.0	96.6	131.0	137.0	147.8	6.2	46.5	85.6	58.7	76.2	100.0	132.2
Blend	144	800	32	160.9	84.8	83.0	96.5	129.0	138.3	147.8	6.4	44.8	86.0	54.2	71.7	94.8	131.0
Blend	145	801	33	171.0	91.7	86.3	102.0	139.0	147.0	157.6	6.8	46.0	88.0	63.0	85.0	108.0	138.5
Blend	146	816	35	156.4	82.2	81.0	94.8	128.0	134.0	143.0	6.6	43.4	82.8	60.5	77.5	100.7	129.3
Blend	147	825	40	161.6	83.3	83.6	96.8	129.0	136.7	146.5	6.0	44.3	85.5	54.5	73.0	98.0	127.6
Cro-Magnon	148	833	53	166.8	90.3	84.5	99.0	134.0	142.6	153.5	6.5	44.0	88.0	58.0	76.5	101.0	134.0
Alpine	149	875	32	158.0	81.6	79.6	96.2	128.0	136.5	146.0	6.8	43.0	83.0	60.0	76.7	95.0	128.8
Iberian	150	-----	32	163.2	86.1	86.0	99.2	131.3	139.0	149.8	7.1	46.3	85.8	54.0	71.0	97.0	129.7
Blend	151	870	---	156.4	82.9	81.4	94.3	126.0	133.0	142.4	6.8	42.8	82.8	54.4	71.5	91.0	126.7
Blend	152	877	30	164.0	87.1	82.8	101.0	134.2	140.8	151.0	7.6	45.8	83.5	57.2	75.7	100.0	134.7
Australoid	153	-----	20	159.9	85.7	82.0	93.5	128.5	136.2	146.3	6.8	44.0	83.0	57.3	74.3	97.8	127.5
Alpine	154	885	60	162.8	85.0	82.0	97.0	132.5	139.5	150.8	6.4	44.6	83.2	57.8	75.4	100.0	132.5
Blend	155	886	80	153.7	80.7	79.4	89.7	125.2	130.0	138.8	6.3	42.5	81.0	54.0	71.0	93.0	124.0
Blend	156	222	26	156.8	82.8	81.6	94.7	125.0	134.1	143.5	5.9	43.5	81.5	58.2	74.2	94.7	125.6
Blend	157	915	40	151.5	81.5	76.6	90.8	122.0	130.0	138.6	6.2	42.5	78.5	56.0	72.2	95.8	124.2
Blend	158	1085	33	149.0	79.2	78.8	89.6	121.8	130.2	138.2	7.2	42.0	77.5	55.5	71.0	95.5	122.0
Alpine	159	921	42	162.6	90.7	77.6	94.0	131.5	136.5	148.5	7.2	44.0	79.3	58.6	76.0	100.0	129.0
Australoid	160	931	27	158.5	83.7	75.4	91.3	121.3	129.3	140.0	5.7	40.4	75.9	52.0	60.6	90.6	123.3

absolute measurements, in centimeters—Continued.

Head.																									
Maximum—																					Circumference.				
Length.	Breadth.	Height.	Forehead width.	Bizygomatic.	Bimastoid.	Bigoniac.	Naso buccal.	Naso alveolar.	Nose base.	Nasion hair line.	Chin nasion.	Nose width.	Nose length.	Mouth width.	Mouth length.	Ear width.	Ear length.	Interocular distance.	Eye length.	Eye color.	Frontal.	Parietal.	Forehead.	Occipital.	Ear cartilage.
18.1	15.5	12.5	10.0	13.8	13.0	11.6	7.5	6.9	3.2	8.4	12.0	4.0	5.3	1.7	5.0	3.8	6.1	3.2	3.00	3	31.0	36.8	27.8	28.0	5.0
17.0	15.2	13.1	10.0	13.8	13.6	11.2	7.3	6.9	3.4	6.5	11.3	4.2	4.8	2.0	5.0	3.6	6.0	3.3	2.80	2	29.4	37.0	27.0	26.0	5.1
17.5	15.5	13.0	10.5	13.8	13.1	10.1	7.4	6.8	3.3	8.1	11.6	4.3	5.2	1.7	5.1	3.6	5.9	3.6	2.70	3	32.0	36.6	28.3	27.0	4.9
18.4	14.7	13.5	10.0	11.0	12.8	10.2	7.7	7.3	3.0	5.7	11.7	4.4	4.7	2.2	5.2	3.7	6.8	3.4	3.05	3.5	29.6	35.6	26.8	29.7	4.8
17.9	15.7	12.8	10.7	14.1	13.1	11.3	7.1	6.5	3.0	6.6	11.3	3.9	4.5	2.6	4.6	3.7	5.7	3.1	2.85	2	29.8	37.2	27.8	27.5	4.7
18.2	14.9	12.7	10.0	14.0	13.6	10.5	8.0	6.8	3.7	7.8	12.2	3.8	5.4	1.5	5.0	4.0	7.3	3.4	2.85	4.5	28.8	35.5	26.6	27.7	5.7
18.0	14.6	12.5	10.0	13.5	13.2	11.0	7.1	6.8	4.0	7.4	11.5	4.0	4.3	2.3	5.0	3.4	5.9	3.3	2.70	2	30.7	35.0	26.4	28.0	5.1
18.4	15.9	12.8	10.3	14.5	13.8	11.0	7.7	6.5	2.8	8.5	11.5	4.7	5.0	.8	5.5	3.7	6.4	3.7	2.40	---	30.6	36.2	27.0	30.0	5.6
18.8	14.2	12.5	9.7	13.8	12.9	10.6	7.2	6.3	3.0	6.7	11.4	3.9	4.6	1.0	5.2	3.2	6.4	3.4	2.80	3	29.8	31.6	28.0	27.6	4.9
18.8	14.6	13.5	10.6	13.5	13.0	10.3	6.5	5.9	2.8	8.0	10.7	3.9	4.0	2.2	4.5	3.4	6.1	3.3	2.95	2	31.0	35.6	27.5	30.0	5.0
16.8	15.0	12.4	9.6	13.0	13.0	10.4	7.0	6.7	2.6	9.0	11.0	3.7	4.7	1.8	4.7	3.3	5.3	2.9	2.60	3	27.5	36.0	25.5	26.0	4.5
17.2	15.2	12.8	10.8	13.7	12.4	11.0	6.0	5.5	2.4	7.4	10.0	3.7	4.1	2.3	4.4	3.3	5.3	3.6	2.85	3	31.7	35.0	28.0	26.0	4.6
18.0	15.8	12.6	10.5	11.1	13.2	10.6	7.0	6.0	3.1	6.1	11.3	3.6	4.6	2.1	4.2	3.6	5.5	3.0	3.10	2	30.6	37.8	26.5	28.5	4.5
17.6	15.6	13.0	10.3	14.0	12.7	10.0	7.0	6.3	3.3	7.2	12.0	4.0	4.8	2.3	5.0	3.2	5.9	3.1	3.00	2	31.3	36.8	26.2	28.5	4.6
18.0	15.0	12.5	10.7	13.9	12.7	10.6	7.1	6.3	2.8	8.5	11.0	4.3	4.4	2.1	5.6	3.7	6.6	3.3	2.75	4	32.0	35.8	28.5	27.5	5.3
18.1	14.1	12.8	10.7	13.0	12.7	9.8	6.8	6.4	2.7	6.2	11.3	3.7	4.3	2.1	4.6	3.1	5.3	3.3	3.10	2	30.8	31.5	27.2	27.3	4.4
17.2	14.8	13.0	10.4	13.5	12.4	10.0	7.0	6.3	3.3	6.0	10.8	4.0	5.0	2.0	5.0	3.9	6.2	3.5	2.75	2	29.5	36.5	26.0	27.0	5.0
18.6	14.7	12.8	10.3	13.0	12.8	10.7	6.6	6.1	2.7	7.0	11.0	3.4	4.4	2.5	4.5	2.7	5.6	3.5	2.95	3	30.2	35.1	27.0	27.8	5.1
19.3	15.3	13.1	10.7	13.7	13.0	10.0	7.0	6.5	3.1	8.0	12.0	3.7	4.4	2.0	5.4	3.4	6.3	3.4	3.15	2	31.0	37.0	28.0	29.6	5.2
19.0	15.0	13.2	11.2	14.1	13.2	10.7	7.0	6.5	2.8	6.4	12.3	4.3	4.5	2.8	4.8	3.8	5.9	3.8	2.85	1	32.5	35.0	29.6	28.0	5.3
19.3	14.1	12.5	10.4	13.7	12.7	10.7	7.6	7.2	3.3	7.0	12.2	4.2	5.2	2.5	5.3	4.0	6.0	3.3	3.10	4	30.4	34.6	29.0	28.0	5.0
19.8	15.1	13.5	10.5	13.7	13.1	11.0	8.3	7.5	3.3	8.8	12.5	4.8	5.3	2.4	5.9	3.9	9.5	3.5	2.95	5	30.6	36.3	27.8	30.4	5.0
18.5	14.3	12.2	10.6	13.5	12.8	10.3	7.3	6.5	3.2	6.6	10.8	4.2	4.7	2.5	4.7	3.2	6.1	3.1	3.15	3	29.6	35.0	26.3	27.6	4.0
18.9	15.1	13.3	11.0	14.4	13.6	11.7	7.2	6.8	3.7	6.8	11.8	4.1	5.1	2.5	4.8	3.3	6.1	3.7	3.15	3	30.7	36.6	28.5	28.0	4.8
19.1	15.5	12.7	10.5	14.0	12.9	10.5	7.3	6.9	3.0	7.8	12.0	4.3	4.9	2.4	5.0	3.5	6.0	3.2	3.00	4	30.8	36.6	28.0	28.0	5.2
18.3	15.5	13.2	10.6	14.1	13.5	10.5	7.4	6.9	2.6	6.8	11.6	4.3	5.3	2.2	4.8	3.5	6.0	3.3	3.00	3	31.8	38.2	28.6	30.3	4.7
18.9	15.1	12.4	10.3	14.0	13.7	10.8	8.0	6.9	3.1	6.3	12.3	4.1	5.4	1.6	5.2	3.8	6.3	3.4	2.95	3.5	32.0	37.2	28.6	29.0	5.1
18.7	15.2	13.1	10.5	14.4	13.8	10.5	6.8	6.0	3.2	8.5	10.8	4.4	4.4	1.8	5.7	3.5	6.8	3.8	2.95	1.5	31.0	36.0	28.0	29.0	5.5
17.7	15.2	12.8	10.0	13.5	12.8	10.1	7.2	6.8	3.0	7.0	11.5	3.1	5.0	2.4	4.7	3.4	5.7	3.0	3.10	2.5	30.6	36.3	27.4	27.6	4.8
19.3	14.7	12.6	10.0	13.8	13.2	11.3	7.4	6.7	2.4	7.0	12.2	4.0	4.8	1.8	4.8	3.0	5.8	3.4	3.00	3	30.5	35.6	28.5	28.5	4.8
17.2	15.0	12.7	10.1	13.5	13.0	11.4	7.2	6.5	2.7	7.8	11.3	3.8	4.5	2.3	4.9	3.9	6.3	3.6	2.85	3	30.7	34.6	26.8	26.8	5.1
19.5	15.3	13.2	10.6	14.4	13.1	10.6	7.5	7.0	2.7	7.7	12.8	4.1	4.8	2.3	4.8	3.7	6.3	3.5	2.90	2.5	33.0	36.5	29.5	28.7	5.4
19.3	13.9	12.6	11.0	12.7	12.0	10.0	6.1	6.3	3.0	6.8	11.4	3.9	4.3	2.5	5.0	3.5	5.5	3.0	3.10	4	29.5	35.2	27.0	29.5	4.5
17.4	16.0	12.0	9.9	14.1	13.6	11.0	7.4	6.4	3.4	6.7	11.4	4.3	5.3	1.5	5.1	3.6	6.7	2.9	2.80	4	29.3	36.0	26.5	27.6	5.6
18.3	15.6	12.8	10.6	14.1	13.3	11.0	7.0	6.6	3.0	9.0	10.8	4.3	5.0	.3	4.5	3.7	7.8	3.1	3.30	4.5	31.6	36.0	28.0	27.0	5.7
18.5	14.6	13.0	10.0	13.4	12.4	10.0	7.1	6.3	2.8	8.0	11.0	4.0	4.5	2.1	4.2	3.1	5.2	3.4	3.15	2	28.3	35.2	27.0	27.7	4.3
17.7	15.5	12.8	10.6	14.3	12.8	10.7	7.0	6.0	2.3	7.4	10.2	4.0	4.5	2.0	5.0	3.5	6.9	3.5	3.00	3	31.0	35.6	28.0	27.5	4.9
17.1	14.3	12.5	10.0	12.5	11.7	9.6	6.4	5.8	2.3	8.0	10.4	3.7	4.3	2.0	4.6	3.4	5.9	3.5	2.65	2	29.4	35.6	26.7	27.2	4.5
18.5	15.6	12.9	11.0	14.5	13.2	12.0	7.6	6.7	3.0	7.4	12.3	2.8	5.1	2.5	5.3	3.3	6.3	3.3	3.25	4	31.8	35.0	28.3	28.0	4.3
18.7	14.5	12.8	10.2	14.2	12.6	11.2	7.3	6.6	3.1	6.0	12.0	4.3	4.6	2.0	5.5	3.1	6.3	3.0	3.15	1.5	30.0	35.7	26.6	30.0	5.0

TABLE I.—*Men of Taytay*—

Type of individual.	Serial No.	Clinical No.	Age.	Body.														
				Stature.	Sitting height.	Pubic height.	Umbilical height.	Sternal height.	Chin height.	Ear height.	Ankle height.	Knee height.	Trochanter height.	Finger tip.	Wrist height.	Elbow height.	Acromion heig
Blend	161	935	30	157.2	83.8	80.6	92.0	128.0	134.7	144.0	5.0	43.0	81.0	-----	-----	-----	-----
Blend	162	934	30	148.2	80.7	73.6	86.5	120.8	126.2	135.3	5.6	39.2	75.7	46.5	63.8	87.5	118.4
Iberian	163	940	38	161.2	82.3	84.2	97.6	129.0	135.0	145.8	6.0	43.2	84.7	51.1	71.2	94.3	128.8
Iberian	164	129	30	159.5	85.9	82.0	96.2	130.0	136.5	145.6	7.5	43.4	83.6	54.7	72.5	95.9	130.0
Australoid	165	941	25	154.7	84.2	79.6	91.0	126.0	131.4	144.0	7.0	43.2	79.4	54.6	71.0	94.5	125.8
Alpine	166	954	30	160.1	84.6	83.3	96.0	131.0	138.0	147.8	6.5	45.3	82.7	57.0	74.8	100.0	131.0
Cro-Magnon	167	471	25	165.3	90.0	85.5	98.6	132.5	143.3	154.0	7.4	44.7	84.2	57.8	75.2	102.5	136.0
Australoid	168	-----	25	158.4	84.0	81.4	95.7	127.2	134.3	145.3	5.9	43.5	82.5	54.3	74.2	95.8	127.5
Blend	169	543	42	163.4	85.2	87.0	101.0	133.0	142.4	152.0	6.3	44.7	87.0	61.2	79.4	103.7	134.7
Blend	170	-----	18	157.1	84.2	79.0	93.5	127.3	136.6	144.2	7.1	44.0	80.8	54.7	71.0	93.0	127.0
Blend	171	-----	40	162.4	86.9	82.6	95.6	132.0	141.3	151.0	6.7	43.6	84.3	60.4	77.2	101.7	133.0
Blend	172	-----	18	152.1	81.7	77.0	89.4	122.2	129.5	140.5	5.3	42.0	79.0	53.8	71.0	93.3	122.7
Blend	173	-----	60	156.6	83.0	82.6	95.0	127.0	135.0	141.5	6.2	43.0	83.2	55.0	73.0	99.0	128.0
Blend	174	1069	64	163.1	86.4	84.3?	97.7	131.0	139.0	150.0	6.1	44.0	84.3?	59.0	76.5	100.7	133.5
Blend	175	1048	20	161.9	84.8	86.2	100.0	133.0	141.4	151.5	6.2	45.6	88.0	56.0	74.6	101.0	134.6
Alpine	176	-----	30	154.8	82.8	80.0	94.0	125.3	133.0	141.2	7.0	42.5	81.7	55.2	71.9	94.4	125.7
Blend	177	1077	29	148.6	79.7	74.5	87.5	120.0	127.5	138.0	6.8	40.0	76.0	53.5	69.6	93.0	121.0
Blend	178	360	31	159.0	84.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Australoid	179	348	39	164.3	88.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Blend	180	-----	28	166.2	90.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	181	-----	(b)	159.9	83.8	81.8	99.0	129.0	135.5	145.4	7.0	44.2	85.0	58.2	77.0	98.6	132.5
Cro-Magnon	182	1086	28	167.2	89.4	86.6	101.0	135.0	145.0	154.6	6.2	45.5	88.2	62.0	79.6	101.0	137.0
Australoid	183	-----	80	160.9	83.4	82.0	99.0	130.0	137.8	148.2	6.2	44.8	86.2	61.0	79.4	102.0	132.0

[b] Adult.

absolute measurements, in centimeters—Continued.

Head.																									
Maximum—																					Circumference.				
Length.	Breadth.	Height.	Forehead width.	Bizygomatic.	Bimastoid.	Bigoniac.	Naso buccal.	Naso alveolar.	Nose base.	Nasion hair line.	Chin nasion.	Nose width.	Nose length.	Mouth width.	Mouth length.	Ear width.	Ear length.	Interocular distance.	Eye length.	Eye color.	Frontal.	Parietal.	Forehead.	Occipital.	Ear cartilage.
18.2	11.8	13.0	10.4	13.7	13.1	10.6	7.0	6.7	2.8	7.1	12.0	4.0	4.6	2.3	4.6	3.5	5.6	3.9	2.85	3	31.0	35.2	26.7	28.0	5.0
17.5	14.9	12.0	9.8	13.1	12.4	9.8	6.2	5.3	2.4	7.3	10.2	3.6	3.7	---	---	3.0	6.0	3.2	2.50	4	30.0	34.6	26.4	27.0	4.8
19.0	15.1	13.0	10.9	14.4	12.9	10.9	7.6	6.7	3.1	7.1	11.6	3.9	4.9	2.0	4.3	3.3	6.6	3.4	3.35	2	32.0	35.4	30.3	28.4	5.0
19.3	15.0	13.0	11.0	13.9	13.3	11.3	7.7	6.7	3.2	8.0	12.3	3.9	5.3	2.4	4.7	3.4	6.2	3.2	3.25	3.5	31.4	36.0	28.7	28.7	5.1
17.7	13.4	12.3	10.0	12.0	11.6	9.7	7.3	6.8	3.0	6.6	11.2	4.1	4.6	2.5	4.5	3.3	5.8	3.5	2.75	3	29.1	33.0	25.6	27.0	5.0
17.6	15.8	12.6	10.7	14.3	14.0	10.8	7.4	6.6	3.1	5.6	11.5	4.0	5.1	2.1	5.0	3.3	6.1	2.9	3.15	1.5	31.2	36.3	27.4	28.5	4.9
18.7	14.1	12.5	11.0	13.8	13.6	11.0	7.0	6.5	3.0	7.1	11.2	4.1	4.6	2.4	5.0	3.4	6.6	3.7	3.00	2	30.0	33.0	27.5	28.7	5.6
19.4	14.8	12.5	11.1	14.3	13.3	11.3	6.8	6.2	2.8	7.7	11.4	3.9	4.6	2.4	5.2	3.3	5.7	3.4	3.15	1.5	31.7	35.6	29.0	29.0	4.7
18.3	14.9	12.4	10.0	13.1	12.8	10.3	7.0	6.4	2.5	7.5	11.1	4.0	4.4	2.3	4.7	3.1	6.0	3.4	2.70	4	30.0	34.0	27.0	29.9	5.1
17.8	14.2	12.5	10.2	13.1	12.7	9.6	7.4	6.8	3.0	6.6	12.0	3.9	4.5	2.5	4.5	3.2	6.6	3.3	3.00	1	28.6	34.0	26.2	28.2	5.1
17.4	14.1	11.5	9.2	13.4	12.6	10.1	7.4	6.6	3.0	6.0	11.0	3.7	4.8	1.7	4.8	3.7	6.2	3.3	2.85	4	27.4	32.3	26.0	27.0	5.3
18.7	14.9	12.2	10.1	13.0	12.8	10.1	7.0	6.3	2.5	7.4	11.6	3.8	4.3	2.4	3.8	3.0	5.6	3.4	2.95	4	30.5	34.6	27.0	28.3	4.3
17.8	14.7	12.3	9.8	13.2	12.7	10.3	7.6	7.4	3.2	5.8	11.6	4.2	4.8	2.0	4.3	3.5	6.4	3.0	3.25	4	29.4	35.0	25.8	28.4	5.4
17.6	15.4	12.2	9.8	13.7	14.0	11.0	7.6	6.3	3.1	---	----	4.1	5.0	.5	4.7	3.2	6.5	3.3	2.75	4	29.3	37.4	25.7	29.5	5.2
17.6	14.8	12.5	11.0	13.9	12.8	10.7	7.6	6.8	2.4	6.5	12.0	4.1	4.9	3.0	4.6	3.3	5.3	3.6	3.15	3	32.6	36.0	29.0	27.5	4.7
17.3	15.3	13.0	10.1	14.2	13.0	10.7	7.5	6.9	3.0	6.9	11.9	3.7	4.9	2.1	4.6	3.2	5.6	3.5	3.05	4	31.0	35.0	28.7	27.7	4.9
17.7	14.3	11.5	10.3	13.8	13.0	11.1	7.0	6.3	3.1	6.8	11.4	4.0	4.6	2.0	4.8	3.3	4.8	3.3	3.20	1.5	30.0	32.8	26.5	27.0	4.5
18.3	15.1	12.4	10.0	13.9	13.0	10.8	7.6	7.2	2.8	7.2	11.6	4.3	5.0	2.1	5.5	3.2	6.2	3.3	3.00	4	31.2	35.8	28.0	29.5	4.7
20.0	15.6	13.0	11.3	14.3	13.7	14.3?	6.8	6.2	2.5	8.0	11.6	4.3	4.7	1.8	5.0	3.2	6.2	4.0	3.05	4	33.5	37.2	29.8	30.4	4.9
19.4	15.5	12.3	11.5	14.5	13.6	11.5	8.0	7.2	3.0	7.6	12.0	4.4	5.2	2.5	5.5	3.2	5.9	4.0	3.20	2	32.0	36.8	28.7	31.5	4.7
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
18.9	14.8	12.8	10.7	14.2	13.1	11.1	7.3	6.5	3.1	7.5	11.6	4.2	5.0	1.9	5.0	3.4	6.3	3.5	3.35	3	30.3	36.0	27.9	29.4	5.2
18.7	14.5	12.7	10.3	13.9	12.7	10.2	7.0	6.2	2.7	6.2	11.2	4.2	5.0	.5	5.0	3.8	7.0	3.2	2.95	3	30.7	35.0	27.8	28.8	5.7

TABLE II.—*Men of Taytay*—

Species of individual. The true species is in parenthesis, except where no parenthesis is given.	No.	Clinical No.	Absolute lower leg length.	Relative lower leg length.	Absolute upper leg length.	Relative upper leg length.	Absolute hand length.	Relative hand length.	Absolute fore-arm length.	Relative fore-arm length.	Absolute upper arm length.
Australoid	1	8	------	------	------	------	------	------	------	------	------
Alpine (Iberian)	2	293	------	------	------	------	------	------	------	------	------
Cro-Magnon	3	366	------	------	------	------	------	------	------	------	------
Blend Primitive	4	370	------	------	------	------	------	------	------	------	------
Australoid	5	------	------	------	------	------	------	------	------	------	------
Blend	6	755	------	------	------	------	------	------	------	------	------
Blend Alpine	7		------	------	------	------	------	------	------	------	------
B. B. B.	8	353	------	------	------	------	------	------	------	------	------
Australoid	9	390	------	------	------	------	------	------	------	------	------
Blend (B. B. B.)	10	398	30.0	23.19	40.7	24.2	18.3	10.88	24.9	14.80	32.8
Primitive Australoid	11	384	35.3	23.45	34.0	22.59	16.0	10.63	23.3	15.48	30.5
Blend (Iberian)	12	------	36.9	21.81	43.0	25.41	19.3	11.41	27.9	16.48	30.3
Blend (Primitive)	13	385	------	------	37.7	24.51	16.3	10.60	22.0	14.30	31.9
Blend (Iberian)	14	------	40.6	25.11	41.3	25.54	17.8	11.01	21.4	13.23	34.1
Blend Primitive?	15	405	34.2	22.48	39.1	25.71	16.1	10.58	20.3	13.35	31.6
Blend (Primitive)	16	380	38.5	25.07	37.2	24.21	15.9	10.35	23.1	15.03	32.5
Australoid?	17	390	35.6	21.81	36.2	22.18	16.8	10.29	25.7	15.75	29.5
Blend (Iberian)	18	376	34.7	22.72	33.2	21.74	14.8	9.69	21.1	13.81	29.5
Alpine (Iberian)	19	404	34.5	22.77	40.3	26.61	16.5	10.89	20.8	13.73	33.7
Blend (Adriatic)	20	315	39.5	23.45	41.4	24.59	17.2	10.21	25.8	15.32	36.0
Australoid	21	158	33.0	20.79	43.0	26.97	17.0	10.66	25.0	15.68	31.3
Blend	22	373	37.7	23.44	39.7	24.68	18.7	11.62	24.9	15.48	30.6
B. B. B.? (Alpine)	23	237	38.5	23.33	42.5	25.75	16.9	10.24	23.8	14.42	30.8
Primitive	24	303	30.7	20.87	39.2	26.65	15.7	10.67	21.3	14.48	30.0
Iberian	25	421	39.1	24.33	42.6	26.51	16.7	10.39	22.4	13.93	36.6
Blend	26	22	35.5	23.17	37.8	24.67	17.0	11.10	21.7	14.16	34.6
Australoid	27	238	38.2	23.38	40.7	24.98	17.6	10.77	22.7	13.89	31.8
Modified Primitive	28	------	36.5	22.97	37.5	23.59	18.0	11.32	21.7	13.65	31.6
Australoid	29	------	35.0	22.47	39.4	25.30	16.4	10.53	22.3	14.32	30.5
Blend	30	------	34.6	23.00	36.6	24.33	17.0	13.03	19.6	13.03	30.0
Primitive (Alpine?)	31	432	34.7	22.57	38.6	25.13	17.2	11.18	25.3	16.46	30.0
Blend (Iberian)	32	438	37.8	23.72	41.3	25.92	17.0	10.67	23.0	14.43	33.0
Iberian	33	431	40.6	23.96	43.6	25.75	20.6	15.71	23.8	14.05	34.1
Australoid	34	------	37.9	23.67	38.5	24.04	18.2	11.36	21.8	13.61	33.8
Iberian	35	430	37.0	22.63	41.0	25.07	17.8	10.88	22.0	13.45	33.1
Adriatic (Modified Primitive).	36	------	38.1	23.16	42.8	26.01	16.7	10.15	19.8	12.03	35.0
Australoid	37	169	38.7	24.12	38.8	24.82	17.1	10.94	23.8	15.22	35.1
Blend (Iberian)	38	448	39.2	24.74	40.9	25.82	18.0	11.36	25.4	16.03	32.3
Australoid	39	------	38.1	24.25	39.2	24.95	18.0	11.45	23.7	15.08	31.3
Blend	40	------	37.3	23.89	38.1	24.40	17.6	11.27	20.4	13.45	32.1
Blend (Iberian)	41	467	37.9	23.03	43.8	26.62	18.1	11.00	24.9	15.13	32.1
Blend (Iberian?)	42	469	36.4	23.41	38.6	24.82	18.6	11.96	21.9	14.08	34.9
Iberian?	43	------	38.7	23.62	39.8	24.29	18.2	11.11	24.8	15.14	33.0
Australoid	44	395	36.5	23.50	35.8	23.05	19.2	12.36	24.4	15.71	31.2
Modified Primitive	45	------	36.7	23.76	37.7	24.41	16.8	10.88	21.7	14.05	33.0
Blend (Primitive)	46	------	33.0	21.71	38.0	25.00	18.0	11.11	22.2	14.60	32.0
Iberian	47	------	34.4	22.26	36.4	23.56	16.3	10.55	24.4	15.79	28.8

indices and relative factors—Continued.

Relative upper arm length.	Pubis to umbilicus.	Umbilicus to sternum.	Omphalic index.	Total head height.	Upper face height.	Cephalic index.	Nasal index.	Ear type.	Physiognomic face index.	Morphologic face index.
------	------	------	------	------	------	80.2	102.5	Primitive, Iberian A	89.8	67.3
------	------	------	------	------	------	84.94	67.30	Iberian A, Iberian D	75.1	77.7
------	------	------	------	------	------	81.90	101.65	Mixed, Primitive	76.5	80.5
------	------	------	------	------	------	82.85	93.02	Iberian A, Primitive	------	------
------	------	------	------	------	------	77.24	104.65	B. B. B., Iberian D	71.1	82.7
------	------	------	------	------	------	80.22	83.67	Iberian B., mixed	78.2	80.4
------	------	------	------	------	------	88.3	80.00	Odd type, mixed	68.8	84.6
------	------	------	------	------	------	82.5	66.6	B. B. B	71.5	89.0
------	------	------	------	------	------	75.90	91.5	Alpine, Primitive	71.6	81.9
19.50	17.0	35.0	48.57	23.7	13.1	84.23	74.0	Iberian A, Iberian D	74.4	75.7
20.26	12.5	32.6	38.34	21.5	14.7	82.0	100.0	Odd type, Primitive	72.3	74.7
17.91	18.7	33.3	56.15	28.2	16.2	79.50	77.77	Iberian D, B. B. B	79.7	84.5
20.74	13.0	31.0	41.94	25.8	14.9	86.20	82.00	Odd type, Primitive	73.8	85.8
21.09	13.0	32.8	39.63	23.0	11.5	84.15	74.0	Iberian B and C	70.7	83.3
20.78	13.2	34.0	38.82	24.1	13.7	86.74	95.65	Alpine, B. B. B., mixed	80.3	72.7
21.15	6.8	33.4	20.36	24.3	13.7	79.40	80.40	Odd type, Iberian D, B. B. B., mixed.	73.9	77.9
18.08	13.5	37.5	36.00	22.7	11.1	76.1	87.7	Alpine, Primitive	71.3	82.8
19.31	19.0	33.0	57.58	25.4	13.6	79.5	72.0	Iberian A	69.8	86.1
22.24	11.1	29.9	37.12	24.8	12.5	84.40	71.42	Iberian D	69.8	89.7
21.38	12.8	32.8	39.03	24.0	12.9	85.24	89.36	Iberian D, odd type	76.4	77.6
19.63	11.0	34.5	31.88	24.8	13.4	80.43	100.0	Mixed	73.3	84.4
19.02	14.8	33.6	44.04	22.0	11.8	83.07	86.95	Odd type, mixed	76.4	74.1
18.66	13.4	36.1	37.12	22.6	10.6	83.06	68.63	Iberian D, odd type	71.7	85.7
20.39	12.5	33.8	36.98	20.1	9.1	83.33	95.25	Iberian C, Primitive	70.4	80.8
22.78	13.4	29.4	45.57	21.2	10.2	77.66	73.90	Mixed, Alpine, Primitive, Iberian C.	76.8	82.7
22.58	14.5	32.5	44.61	22.9	11.9	79.03	86.00	Primitive, B. B. B	76.5	80.2
19.46	12.1	34.0	35.58	21.8	13.2	78.75	91.30	Mixed, B. B. B	67.8	87.1
19.85	15.0	35.1	46.15	23.4	12.3	92.48	85.41	Mixed	79.3	78.1
19.65	16.5	29.5	55.93	20.7	9.3	77.41	91.30	Mixed, Iberian A, Primitive	73.9	83.8
19.95	14.0	34.3	40.82	24.4	13.4	80.11	80.43	Alpine, Primitive	75.0	81.4
19.53	13.1	33.8	38.75	21.2	10.1	93.37	82.97	Mixed, Primitive	74.6	80.4
20.71	11.1	33.3	33.33	22.0	12.6	87.57	81.25	Iberian B	83.0	66.1
20.08	14.5	34.0	42.64	22.3	10.1	72.76	73.58	Iberian, mixed A and C	67.6	88.4
21.11	13.2	33.0	40.00	22.9	11.7	81.76	95.55	Modified Iberian B, and C, odd type.	79.6	81.7
20.24	14.3	37.4	38.23	23.8	11.8	77.43	80.00	Iberian A, Primitive	67.5	88.8
21.27	15.5	34.0	45.58	24.5	13.5	88.30	102.50	Malay, Chinese	75.2	78.5
22.45	13.2	31.8	41.50	22.1	11.5	79.12	95.23	Iberian B, mixed, Iberian C	77.9	76.8
20.39	11.0	30.6	35.94	20.4	9.8	82.58	84.00	Iberian D	71.9	80.9
19.92	14.6	33.4	43.71	21.3	11.0	80.00	92.60	Alpine	71.5	78.6
20.56	16.1	32.6	49.38	22.1	11.0	81.31	84.07	Modified Primitive	73.9	79.8
19.51	11.4	38.4	29.68	21.8	10.6	81.32	78.84	Iberian C and B	77.7	80.0
22.44	14.3	29.3	48.80	22.2	11.0	79.55	78.84	Odd type, B. B. B., Iberian D	70.1	82.3
20.14	16.7	31.6	52.84	24.5	12.7	78.33	81.25	Modified Iberian C	77.9	85.5
20.09	10.1	38.6	26.16	21.9	11.5	78.88	97.67	Iberian D, Iberian C	86.7	72.2
21.37	12.2	32.8	37.19	24.4	13.4	90.61	93.33	Odd type, Primitive	71.2	82.0
21.05	14.8	33.0	44.84	22.5	11.2	86.36	93.02	Primitive, Iberian C	75.1	84.9
18.64	12.7	34.2	37.13	22.0	11.4	76.16	72.54	Iberian A	82.3	73.1

TABLE II.—*Men of Taytay*—

Species of individual. The true species is in parenthesis, except where no parenthesis is given.	No.	Clinical No.	Absolute lower leg length.	Relative lower leg length.	Absolute upper leg length.	Relative upper leg length.	Absolute hand length.	Relative hand length.	Absolute forearm length.	Relative forearm length.	Absolute upper arm length.
Australoid	48	484	34.4	22.33	38.6	25.06	16.2	10.52	19.5	12.26	33.3
Blend (Adriatic)	49	486	40.7	24.35	38.8	23.22	21.0	12.57	24.0	14.36	30.8
Iberian?	50	17	37.7	23.80	40.0	25.25	18.0	11.36	24.5	15.46	33.5
Blend (Modified Primitive).	51	465	35.7	22.66	40.7	25.84	16.7	10.60	21.0	13.33	34.4
Blend (Iberian)	52	------	36.9	23.14	38.8	24.34	16.9	10.60	23.0	14.42	28.8
Cro-Magnon	53	------	41.0	24.07	47.1	27.59	20.8	11.89	24.3	14.23	33.9
Cro-Magnon?	54	------	40.1	24.04	40.0	23.98	19.5	11.68	23.3	13.96	34.7
Cro-Magnon	55	477	41.3	24.51	42.6	25.22	18.0	10.68	26.5	15.72	33.5
Blend	56	481	37.8	23.42	41.1	25.46	17.3	10.72	22.5	13.94	32.5
Blend (Iberian)	57	471	36.2	22.94	39.5	25.03	18.0	11.39	23.2	14.69	30.0
Blend (Iberian)	58	234	37.4	22.57	40.1	24.20	18.8	11.34	24.2	14.60	31.5
Blend (Modified Primitive).	59	489	36.0	23.98	37.0	24.10	18.1	11.74	21.9	14.21	32.6
Blend (Iberian)	60	488	41.0	24.36	39.8	23.64	19.0	11.29	21.6	14.61	35.9
Blend (Iberian)	61	485	39.0	24.21	39.9	24.15	20.2	12.22	23.0	13.92	31.8
Blend	62	482	39.6	23.71	42.0	25.14	17.4	14.19	26.4	15.80	32.0
Alpine	63	492	36.8	22.39	42.4	25.80	18.6	11.32	22.4	13.63	34.6
Blend	64	466	38.2	23.72	39.7	24.65	17.8	11.05	23.6	14.65	32.4
Iberian	65	514	37.0	23.03	40.7	25.34	17.2	10.70	23.6	14.69	32.8
Iberian	66	501	39.1	23.84	40.0	24.39	18.9	11.52	22.6	13.78	33.6
Blend (Iberian)	67	988	35.4	22.53	40.3	25.65	17.1	10.88	21.2	13.49	31.6
Australoid	68	462	36.2	23.02	37.6	23.98	16.7	10.62	21.9	13.93	31.4
Blend	69	------	------	------	------	------	------	------	------	------	------
Blend	70	------	34.1	21.97	38.9	25.06	17.8	11.46	19.6	12.62	32.4
Blend (Iberian)	71	505	37.8	23.71	41.4	25.97	18.4	11.54	21.4	13.42	33.1
Blend	72	526	36.9	24.30	36.0	23.71	14.0	8.56	22.8	15.01	33.2
Blend (Iberian)	73	------	38.0	23.27	40.2	24.61	18.1	11.08	24.4	14.94	32.3
Cro-Magnon	74	535	38.1	22.45	46.6	27.46	20.4	12.02	26.7	15.73	34.1
Blend (Iberian)	75	521	39.0	23.11	41.3	24.48	16.8	9.60	23.1	13.69	33.3
Blend (Alpine)	76	528	35.8	22.80	40.8	25.98	17.0	10.82	21.5	13.69	30.0
Blend (Alpine)	77	503	37.5	23.96	39.7	25.36	16.7	10.67	22.2	14.18	31.1
Modified Primitive	78	836	36.3	23.12	37.0	23.56	16.3	10.38	21.6	13.75	34.1
Australoid	79	529	35.7	23.51	33.3	21.93	16.4	10.80	21.7	14.29	30.3
Iberian	80	522	33.3	21.15	40.8	25.92	18.1	11.49	22.7	14.42	31.5
Iberian	81	520	37.7	23.45	37.3	23.26	16.6	10.35	21.7	13.53	33.9
Blend (Alpine)	82	537	38.7	23.94	39.0	24.13	18.4	11.38	22.7	14.04	32.9
Blend	83	225	36.6	22.81	43.9	27.36	16.2	10.09	23.3	14.52	31.4
Iberian	84	703	33.5	21.47	40.8	26.15	20.2	12.94	20.9	13.39	31.6
Australoid	85	------	39.0	23.99	87.5	23.07	16.6	10.21	20.8	12.80	34.0
Australoid	86	566	37.6	23.61	39.2	24.62	16.8	10.55	23.7	14.88	32.9
Modified Primitive	87	------	38.0	24.35	38.4	24.61	17.8	11.41	23.6	15.12	33.1
Alpine	88	180	37.5	23.86	38.8	24.71	18.2	11.59	24.6	15.66	33.0
Australoid (Typical?)	89	564	87.8	23.81	36.1	23.02	19.4	12.37	21.6	13.77	30.6
Cro-Magnon?	90	560	42.2	24.72	42.4	24.83	21.5	12.59	22.5	13.18	36.5
Blend (Primitive)	91	551	33.8	22.48	38.2	25.33	17.7	11.73	22.7	15.05	34.1
Blend (Iberian)	92	556	33.9	22.27	39.6	26.01	17.8	11.69	21.0	13.79	31.6
Blend	93	558	37.9	23.36	41.4	25.52	18.7	11.52	23.7	14.61	31.4

indices and relative factors—Continued.

Relative upper arm length.	Pubis to umbilicus.	Umbilicus to sternum.	Omphalic index.	Total head height.	Upper face height.	Cephalic index.	Nasal index.	Ear type.	Physiognomic face index.	Morphologic face index.
21.62	13.5	31.1	39.58	18.9	9.6	79.77	93.02	Primitive, Iberian C	76.1	70.9
18.43	16.0	34.6	46.24	21.8	10.7	87.77	89.13	Odd type, Iberian C, B. B. B.	75.1	79.8
21.15	14.0	33.1	42.29	26.9	14.9	78.60	79.59	Iberian C, B. B. B., Iberian D (Cro-Magon).	73.6	85.7
21.81	12.7	34.2	37.13	22.5	12.2	86.44	92.10	Primitive	78.6	73.5
18.06	13.5	35.5	38.03	21.4	8.7	84.78	84.46	Iberian C	71.9	90.0
19.85	14.0	33.8	41.42	23.4	11.6	77.30	82.22	Iberian C	72.1	89.3
20.80	14.7	35.2	41.81	21.0	12.0	79.80	100.00	Mixed, Iberian D, Primitive, Iberian A and C.	74.7	81.0
19.88	15.6	35.2	46.98	22.3	10.0	82.90	95.30	Odd type, Primitive, Iberian D.	73.4	86.9
20.13	14.0	34.8	40.46	21.2	10.8	83.33	93.00	Iberian A, odd type	77.6	78.7
19.01	12.7	35.8	35.49	21.8	9.8	83.15	82.23	Iberian B	71.8	92.3
19.07	15.9	35.3	43.01	23.9	11.7	87.29	80.39	Iberian C	67.8	89.0
21.15	12.6	32.2	39.13	22.3	11.4	88.70	100.00	Iberian D, mixed	74.4	81.3
21.33	17.3	33.8	51.18	22.6	11.4	81.53	90.00	Iberian D, Iberian B	77.3	76.0
19.24	18.5	30.7	60.26	21.6	10.4	79.36	84.31	Iberian B and C	76.2	75.6
19.16	16.7	34.3	48.69	20.7	10.2	85.31	84.09	Modified Primitive, Alpine	75.9	73.9
21.06	14.0	32.4	46.29	24.8	13.5	85.14	66.66	Odd type, Iberian B and C	77.9	76.3
20.12	14.2	33.0	43.03	22.2	10.4	80.42	84.00	Iberian B, Primitive	70.4	86.7
20.48	12.2	33.0	36.96	26.3	15.0	76.21	78.72	Iberian C, Iberian D (Cro-Magnon, (B. B. B.)	68.3	83.0
20.48	12.5	37.3	33.51	23.0	11.5	77.27	85.41	Iberian, mixed	69.2	80.9
22.02	12.0	31.3	38.33	22.1	12.2	85.54	86.95	Iberian D	85.2	71.2
19.97	14.2	35.8	39.66	19.7	10.2	78.08	100.00	Primitive	80.2	73.0
......	......	......	......	......	......	80.32	86.51	Primitive, B. B. B.	72.2	83.9
20.87	12.3	33.9	36.28	23.4	11.8	79.70	82.00	Mixed, Primitive	70.3	87.1
20.76	12.3	33.9	36.28	20.7	9.3	81.83	82.35	Iberian D	67.0	89.0
21.86	13.4	31.0	43.22	22.6	......	86.14	86.01	Iberian C, Alpine, Primitive	......	......
19.77	17.3	32.2	53.73	22.8	11.5	80.10	82.97	Mixed, Iberian B and C	77.5	81.9
20.09	16.5	32.0	51.56	25.4	12.9	76.16	89.13	Modified Iberian A, Alpine	67.3	88.0
19.73	14.9	35.5	41.97	23.7	11.7	85.10	86.00	Iberian A	80.6	80.0
19.10	13.1	30.4	43.09	21.0	9.8	81.96	72.34	Iberian C, Primitive	75.0	79.4
19.87	13.7	33.3	41.14	21.8	11.1	81.71	76.00	Iberian A, Primitive, odd type	78.8	77.5
21.71	11.8	33.5	35.22	26.0	15.0	89.14	95.00	Primitive	75.0	78.0
19.96	13.0	33.4	38.92	21.8	9.8	76.47	85.41	Iberian B, Alpine, Primitive	67.9	93.0
20.01	14.5	33.2	43.67	25.2	13.7	70.50	79.19	Iberian D, mixed, Iberian A	69.3	80.9
21.14	14.8	33.1	44.71	21.6	13.6	75.00	78.43	Iberian B, Primitive, Iberian D.	75.4	79.7
20.48	16.6	34.5	48.11	30.6	12.5	84.23	75.47	B. B. B.	69.8	91.2
19.57	14.8	33.0	44.84	23.4	11.3	80.11	88.37	Iberian, mixed	70.4	88.9
20.25	16.5	31.6	52.21	22.6	10.3	77.59	81.63	Iberian D	73.1	90.4
20.92	13.0	33.1	39.27	23.5	11.0	76.14	93.75	Iberian C, Primitive	65.7	91.9
20.66	14.6	35.5	41.12	......	......	76.59	110.00	Iberian C, Primitive	84.2	76.9
21.21	14.8	31.4	47.13	21.5	......	89.15	84.44	Primitive, Alpine	......	......
21.01	14.1	33.7	41.83	21.2	9.2	86.85	74.50	Primitive, Iberian C	71.0	85.7
19.51	14.3	30.2	47.35	22.2	11.6	73.68	102.22	Odd type	84.9	75.1
21.38	15.1	34.2	44.15	21.9	10.6	78.57	81.81	Iberian C	72.7	86.2
22.61	13.3	30.3	43.89	21.8	11.8	85.00	88.09	B. B. B., Iberian A	75.8	75.7
20.76	12.5	31.1	40.19	22.7	11.7	85.29	83.33	Iberian A?	69.5	81.4
19.35	11.3	83.2	34.03	23.7	12.4	83.99	79.16	Iberian B, Primitive	70.8	81.8

TABLE II.—*Men of Taytay*—

Species of individual. The true species is in parenthesis, except where no parenthesis is given.	No.	Clinical No.	Absolute lower leg length.	Relative lower leg length.	Absolute upper leg length.	Relative upper leg length.	Absolute hand length.	Relative hand length.	Absolute fore-arm length.	Relative fore-arm length.	Absolute upper arm length.
Blend	94	474	32.4	21.81	35.6	23.97	16.4	11.04	20.4	13.73	29.4
Australoid	95	580	37.0	23.44	39.0	24.71	16.4	10.39	21.2	13.43	32.4
Australoid	96		37.6	23.36	35.6	22.12	17.8	11.06	21.9	13.61	31.7
Blend (Australoid)	97	581	37.9	23.52	39.8	24.31	18.0	10.99	25.0	15.27	33.0
Australoid	98	------	35.8	22.73	38.2	21 25	16.9	10.73	21.5	13.65	33.1
Australoid	99	176	37.3	23.78	39.6	25.25	18.7	11.92	23.0	14.66	33.9
Blend	100	584	36.5	23.44	37.3	23.95	18.6	11.94	21.6	13.87	31.5
Blend (Modified Primitive.)	101	596	30.3	24.1	38.0	23.3	17.3	10.6	22.0	13.5	32.0
Blend	102	589	38.1	23.2	42.2	25.7	18.8	11.4	26.5	16.1	35.5
Cro-Magnon	103	616	40.6	24.3	40.6	24.3	19.5	11.6	24.5	14.7	32.6
Blend (Iberian)	104	63	34.8	22.2	40.3	25.7	16.3	10.3	20.7	13.2	34.0
Blend	105	603	37.0	23.7	38.2	24.5	17.8	11.4	22.2	14.2	33.0
Blend	106	------	39.1	24.5	39.8	24.9	18.3	11.4	22.8	14.3	33.2
Blend	107	104	37.2	24.3	37.7	24.6	17.2	11.2	20.5	13.4	33.0
Blend	108	------	38.9	21.4	39.5	24.7	18.2	11.4	22.6	14.1	30.5
Alpine (Iberian)	109	653	38.9	23.9	39.9	23.9	17.8	10.9	22.7	13.9	34.8
Primitive?	110	------	35.5	23.7	31.1	20.7	15.4	10.3	20.6	13.7	31.3
Blend	111	638	39.4	24.7	38.3	24.0	17.0	10.7	23.9	15.0	30.1
Blend	112	------	37.3	24.6	36.1	23.8	17.3	11.4	19.9	13.1	30.0
Australoid	113	628	36.5	23.5	38.2	24.6	18.3	11.8	21.8	14.0	31.2
Cro-Magnon	114	656	41.3	24.8	42.5	25.4	20.2	12.1	23.5	14.0	35.5
Blend	115	639	34.5	21.9	36.5	23.2	16.4	10.4	22.6	14.3	30.7
Blend (Primitive)	116	631	35.1	23.8	38.0	25.8	14.7	10.0	20.8	14.1	(?)
Blend	117	------	59.8	24.5	38.9	23.9	16.8	11.6	22.2	13.6	33.8
Blend	118	316	39.8	24.4	40.2	24.6	16.7	10.2	24.7	15.1	31.0
Iberian	119	------	39.1	25.0	37.8	24.1	17.8	11.3	23.3	14.9	31.6
Blend (Iberian)	120	654	36.3	23.7	38.4	25.1	17.2	11.2	24.9	16.2	29.1
Blend	121	662	40.4	24.5	42.3	25.7	19.3	11.7	26.7	16.2	34.7
Modified Primitive	122	657	37.5	23.3	36.5	22.6	19.1	11.8	25.0	15.5	32.9
Blend	123	651	39.1	23.9	41.7	25.5	17.6	10.7	24.0	14.6	32.5
Australoid	124	650	35.8	22.9	37.5	24.0	16.0	10.2	21.4	13.7	30.6
Blend (Iberian)	125	609	34.0	20.7	43.2	26.2	18.2	11.0	25.2	15.3	34.7
Blend (Iberian)	126	692	40.1	24.1	42.5	25.5	19.0	11.4	25.7	15.4	33.5
Australoid	127	------	37.9	24.6	35.0	22.8	14.8	9.6	21.5	14.0	32.5
Blend	128	708	37.9	23.8	39.0	24.6	17.3	10.9	23.4	14.7	32.5
Australoid	129	686	35.9	23.0	40.0	25.6	15.8	10.1	23.2	14.9	32.0
Cro-Magnon	130	710	40.4	24.1	40.0	23.8	18.0	10.7	23.5	14.0	33.0
Alphine (Iberian?)	131	730	37.8	23.9	36.8	23.3	17.2	10.9	21.9	13.8	33.5
Blend (Modified Primitive)	132	764	37.2	23.8	39.5	25.2	17.6	11.2	21.7	13.8	34.3
Blend (Iberian)	133	726	39.2	24.5	40.0	25.0	18.0	11.2	23.4	14.6	33.6
Blend (B. B. B.)	134	757	40.9	27.2	41.2	24.4	18.3	10.8	27.4	16.2	34.0
Australoid	135	758	38.3	23.7	39.9	24.6	18.1	11.2	23.2	14.3	36.4
Australoid	136	760	35.6	23.8	35.8	23.9	14.8	9.9	22.6	15.1	32.9
Blend (Primitive)	137	761	33.4	22.9	36.3	24.9	18.2	12.5	18.6	12.7	29.4
Iberian	138	756	38.7	24.4	38.8	24.5	18.0	11.3	22.8	14.4	33.0
Blend	139	------	34.3	21.9	36.9	23.5	15.5	9.8	23.3	14.8	33.5
Australoid	140	------	40.4	25.1	38.7	24.0	18.2	11.3	21.6	13.4	35.0
Iberian	141	------	38.8	23.3	40.5	24.3	17.4	10.4	24.1	14.4	34.0

indices and relative factors—Continued.

Relative upper arm length.	Pubis to umbilicus.	Umbilicus to sternum.	Omphalic index.	Total head height.	Upper face height.	Cephalic index.	Nasal index.	Ear type.	Physiognomic face index.	Morphologic face index.
19.79	13.6	32.0	42.50	23.1	12.1	83.05	80.39	Iberian C, Primitive	69.5	81.4
20.53	15.0	34.3	43.73	22.5	11.5	77.00	95.23	Iberian B, Iberian C	71.4	81.4
19.70	16.8	31.3	48.97	21.6	12.8	81.72	97.61	Primitive, Alpine	67.6	85.5
20.15	15.8	30.7	51.46	23.2	11.3	81.28	91.48	Iberian C, Alpine	75.6	83.2
21.01	17.4	32.2	54.31	23.7	12.4	82.60	97.67	Primitive, odd type, mixed	76.5	80.7
21.61	13.2	33.6	39.28	19.8	8.7	81.50	95.30	Mixed	76.8	81.6
20.23	12.8	31.7	40.37	22.7	11.3	79.67	81.25	Iberian A, Iberian D, mixed	70.2	83.1
19.6	14.1	31.8	40.5	22.3	11.0	85.10	89.79	Mixed	81.2	78.9
21.6	15.0	33.0	45.4	22.8	11.8	83.88	77.08	Mixed, subnothern	77.9	79.7
19.5	13.5	33.8	39.9	25.4	13.7	75.77	97.61	Iberian C	73.2	83.5
21.7	15.6	30.3	51.4	23.6	12.6	79.14	88.09	Iberian C	74.0	80.2
21.2	16.1	31.0	51.8	23.4	11.8	81.04	86.00	Primitive odd type	70.4	81.0
20.8	14.2	32.8	43.2	20.9	------	83.14	73.91	Mixed, Iberian, B. B. B	------	------
21.5	13.7	33.3	41.1	21.4	10.7	84.09	88.37	Mixed, Iberian A	77.4	78.1
19.1	12.4	30.6	40.5	21.1	12.2	84.40	83.33	Iberian A, B. B. B	67.6	86.2
21.4	14.2	31.4	45.2	22.0	10.9	91.28	60.37	Iberian C	76.9	75.5
20.9	16.0	28.3	56.5	23.3	12.6	88.95	80.13	Alpine, Primitive	80.4	74.3
18.9	15.0	30.8	48.7	24.6	12.8	82.41	86.95	Iberian B, mixed, Alpine	74.1	85.5
19.7	13.0	32.3	40.2	22.6	12.1	78.02	86.36	Primitive, subnothern	74.4	80.1
20.0	12.2	37.2	32.8	22.5	------	80.32	95.45	Odd type, Primitive	------	------
21.2	13.6	32.0	42.5	23.4	12.1	75.12	100.00	Mixed, subnothern	69.9	83.7
19.5	17.3	31.2	55.4	22.8	12.5	81.76	80.43	Modified Iberian A, Primitive	75.5	75.7
------	12.6	30.0	42.0	20.9	9.8	87.05	80.00	Mixed, Primitive	78.3	85.3
20.8	13.8	33.0	41.8	23.4	10.9	83.88	79.62	Odd type, mixed, Primitive	71.8	92.5
19.0	14.2	31.6	44.9	21.2	10.2	86.51	81.81	Iberian C, mixed	79.0	78.5
20.2	15.2	31.5	48.2	22.4	10.3	77.96	72.00	Iberian A	69.1	91.6
18.9	13.7	30.1	44.0	22.7	10.6	81.48	73.58	Iberian D, mixed	69.6	85.2
21.1	13.3	33.9	39.2	21.9	9.9	85.63	75.47	Odd type Primitive	67.6	86.9
20.4	16.1	34.0	47.3	23.2	11.9	89.41	87.50	Mixed, odd type, subnothern	77.5	81.8
19.8	15.8	32.5	48.6	23.5	11.9	88.57	82.69	Mixed, Iberian A, (Iberian D,) B. B. B.	70.1	84.0
19.6	14.4	33.2	43.3	23.7	12.0	79.89	93.61	Odd type, mixed, Primitive	80.4	83.5
21.1	15.1	31.0	44.4	22.7	11.4	87.70	86.66	Iberian C	78.7	80.1
20.1	13.7	30.3	45.0	25.5	13.3	81.86	70.37	Iberian C	70.0	87.1
21.1	15.4	27.7	55.6	21.5	10.0	81.11	93.02	Mixed, subnothern	71.4	85.1
20.5	14.4	33.3	43.2	21.2	9.7	86.40	94.00	Mixed, odd type, Primitive	72.5	79.3
20.5	13.5	32.2	41.9	24.2	12.8	75.50	81.70	Iberian B and C, (Iberian D)	76.2	82.6
19.6	14.6	35.3	41.8	22.7	12.0	77.60	97.50	Iberian C, mixed	72.1	79.2
21.2	13.1	35.7	36.7	20.7	9.7	89.28	78.72	Iberian A and C	65.0	84.6
21.9	14.0	32.5	43.1	23.0	13.0	88.37	90.21	Mixed, Alphine	78.7	72.9
20.6	11.5	32.5	35.3	23.2	11.9	87.77	78.26	Iberian A	81.0	80.1
20.1	14.5	35.3	41.1	21.2	12.2	88.63	83.33	Mixed Primitive	72.9	85.7
22.5	16.0	34.2	46.7	23.6	12.6	83.33	97.72	B. B. B., mixed	71.2	79.9
22.0	13.0	(?)	------	22.8	11.5	77.89	86.01	Iberian C, B, mixed	74.2	86.9
20.1	10.1	32.2	31.3	21.7	10.9	86.04	80.00	Odd type, mixed	79.1	81.1
20.8	14.9	31.7	47.0	19.8	8.8	79.03	77.27	Iberian C, odd type	72.2	84.6
21.3	14.3	35.7	40.0	21.1	9.1	79.27	84.09	Iberian A, mixed, Primitive	68.5	87.6
21.7	11.5	32.0	35.9	23.7	11.4	78.95	95.55	Iberian A, B, mixed	75.4	87.2
20.4	13.5	35.3	38.2	22.7	10.5	73.05	80.76	Mixed, odd type, Iberian A	71.3	89.0

TABLE II.—*Men of Taytay*—

Species of individual. The true species is in parenthesis, except where no parenthesis is given.	No.	Clinical No.	Absolute lower leg length.	Relative lower leg length.	Absolute upper leg length.	Relative upper leg length.	Absolute hand length.	Relative hand length.	Absolute fore-arm length.	Relative fore-arm length.	Absolute upper arm length.
Australoid	142	784	39.9	24.3	39.7	24.2	19.5	11.8	25.5	15.5	32.0
Australoid	143	775	40.3	25.2	39.1	24.4	17.5	10.9	23.8	14.9	33.2
Blend	144	800	38.4	23.8	41.2	25.6	17.5	10.8	23.1	14.3	36.2
Blend (Cro-Magnon)	145	801	39.2	22.9	42.0	24.5	22.0	12.8	23.0	13.4	30.5
Blend	146	816	36.8	23.5	39.4	25.1	17.0	10.8	23.2	14.8	28.6
Blend	147	825	38.3	23.6	41.2	25.5	18.5	10.8	25.0	15.4	29.6
Cro-Magnon	148	833	37.5	22.4	44.0	26.3	18.5	11.1	24.5	14.6	33.0
Alpine (Iberian)	149	875	36.2	22.9	40.0	25.3	16.7	10.5	18.3	11.5	33.8
Iberian	150	------	39.2	24.0	39.5	24.2	17.0	10.4	26.0	15.9	32.7
Blend	151	870	36.0	23.0	40.0	25.5	17.1	10.9	22.5	14.3	32.7
Blend (Iberian)	152	877	38.2	23.3	37.7	22.9	18.5	11.2	21.3	14.8	34.7
Australoid	153	------	37.2	23.2	39.0	24.3	17.0	10.6	23.5	14.7	29.7
Alpine (Iberian?)	154	885	38.2	23.4	38.6	23.7	17.6	10.8	24.6	15.1	32.5
Blend (Iberian?)	155	886	36.2	23.5	38.5	25.0	17.0	11.1	22.0	14.3	31.0
Blend	156	222	27.6	23.9	38.0	24.2	16.0	10.2	20.5	13.1	30.9
Blend (Primitive)	157	915	36.8	23.9	36.0	23.7	16.2	10.6	23.6	15.5	28.4
Blend (Primitive)	158	1,085	34.8	23.3	35.5	23.8	15.5	10.4	24.5	16.4	26.5
Alpine	159	921	37.4	23.0	34.7	21.3	17.4	10.7	24.0	14.7	29.0
Australoid	160	931	34.7	22.6	35.5	23.1	17.6	11.4	21.0	13.6	32.7
Blend (Iberian)	161	935	38.0	24.1	38.0	24.1	17.0	10.8	24.0	15.2	28.0
Blend (Primitive)	162	934	33.6	22.6	36.5	24.6	17.3	11.6	23.7	15.9	30.9
Iberian?	163	940	37.2	23.1	41.5	25.7	16.8	10.4	23.1	14.3	34.5
Iberian	164	129	35.9	22.5	40.2	25.2	17.8	11.1	23.4	14.6	34.1
Australoid	165	941	36.2	23.4	36.2	23.4	16.4	10.6	23.5	15.1	31.3
Alpine (Iberian?)	166	954	38.8	24.2	37.4	23.3	17.8	11.1	25.2	15.7	31.0
Cro-Magnon	167	471	37.3	22.5	39.5	23.9	17.4	10.5	27.3	16.5	33.5
Australoid	168	------	37.6	23.7	39.0	24.6	19.9	12.5	21.6	13.6	31.7
Blend (Australoid)	169	543	38.4	23.5	42.3	25.8	18.2	11.1	24.3	14.8	31.0
Blend	170	------	36.9	23.4	36.8	23.4	16.3	10.3	22.0	14.0	34.0
Blend (Iberian)	171	------	36.9	22.7	40.7	25.1	16.8	10.3	24.5	15.1	31.3
Blend	172	------	36.7	24.1	37.0	24.3	17.2	11.3	22.3	14.6	29.4
Blend	173	------	36.8	23.5	40.2	25.6	18.0	11.5	26.0	16.6	29.0
Blend	174	1,009	37.9	23.2	20.3	------	17.5	10.7	24.2	14.8	32.8
Blend	175	1,048	39.4	23.9	42.4	25.7	18.6	11.2	26.4	16.0	33.6
Alpine	176	------	35.5	22.9	39.2	25.3	16.7	10.8	22.5	14.5	31.3
Blend (Iberian)	177	1,077	33.2	22.3	36.0	24.1	16.1	10.8	23.4	15.7	28.0
Blend	178	360	------	------	------	------	------	------	------	------	------
Australoid	179	348	------	------	------	------	------	------	------	------	------
Blend	180	------	------	------	------	------	------	------	------	------	------
------	181	------	37.2	23.2	40.8	25.5	18.8	11.7	21.6	13.5	33.9
Cro-Magnon	182	1,086	37.3	22.3	42.7	25.5	17.6	10.5	24.4	14.5	33.0
Australoid	183	------	38.6	23.9	41.4	25.7	18.4	11.4	22.6	14.0	30.0

indices and relative factors—Continued.

Relative upper arm length.	Pubis to umbilicus.	Umbilicus to sternum.	Omphalic index.	Total head height.	Upper face height.	Cephalic index.	Nasal index.	Ear type.	Physiognomic face index.	Morphologic face index.
19.5	11.0	37.4	29.4	25.0	12.5	76.21	90.57	B. B. B., Alpine	64.3	91.2
20.7	13.6	34.4	39.5	22.8	12.0	77.29	89.36	Primitve, Iberian A	77.5	80.0
22.4	13.5	32.5	41.5	22.6	10.8	79.89	81.96	Primitive, odd type, Iberian A.	77.4	81.9
17.8	15.7	37.0	42.4	24.0	12.0	81.10	87.70	Iberian, mixed	70.7	85.7
18.3	13.8	33.2	41.5	22.4	[illegible]	[illegible]	81.10	Primitive, mixed	76.6	82.2
18.3	13.2	32.2	40.9	24.9	12.6	79.80	75.91	Iberian D, odd type	75.2	87.8
19.8	14.5	35.0	41.4	24.2	13.4	81.20	100.00	Iberian D	74.6	75.0
21.4	16.6	31.8	52.2	21.5	10.0	85.87	62.00	Iberian A	71.9	85.1
20.0	13.2	32.1	41.1	24.2	12.0	76.16	83.33	Iberian A	71.8	88.4
20.9	12.9	31.7	40.7	23.4	12.1	87.20	84.44	Primitive, mixed	70.6	83.7
21.1	18.2	33.2	51.5	23.2	10.4	78.46	85.41	Primitive, mixed	70.2	88.8
18.5	11.5	35.0	32.8	23.7	12.3	72.02	90.70	Mixed, Primitive, Iberian A	69.7	89.7
19.9	15.0	35.5	42.2	23.3	11.9	91.95	81.13	Iberian D	77.9	80.8
20.1	10.3	35.5	29.0	23.7	12.9	81.15	86.00	Iberian D	71.2	76.5
19.7	13.1	30.3	43.2	22.7	11.7	78.91	88.88	Iberian A, Primitive	70.5	81.9
18.7	14.2	31.2	45.5	21.5	11.3	87.57	88.88	Alpine, Primitive	81.2	71.3
17.7	10.8	32.2	33.5	18.8	8.4	83.60	86.00	Mixed, Iberian A, Primitive	67.9	83.1
17.8	16.4	37.5	43.7	26.1	13.8	84.32	51.90	B. B. B., Primitive	75.1	84.8
21.3	15.9	30.0	53.0	24.2	12.2	77.54	93.48	Odd type, Primitive	78.8	81.5
17.8	11.4	36.0	31.7	22.5	10.5	81.87	86.95	Iberian B	71.7	87.6
20.8	12.9	34.3	37.6	22.0	11.8	85.14	92.30	Iberian A, mixed, Primitive, odd type.	74.8	77.7
21.7	13.4	31.4	42.6	26.2	14.6	79.47	79.59	Mixed, Iberian A, odd type, Iberian D.	77.0	80.5
21.4	14.2	34.8	40.8	23.0	10.7	77.72	73.56	Iberian A, Iberian D, odd type.	68.4	88.8
20.2	11.4	35.0	32.6	20.3	9.1	75.70	89.13	Mixed, Iberian A	67.4	93.3
19.3	12.7	35.0	36.3	22.1	10.6	89.77	78.43	Iberian D	83.6	80.4
20.2	13.1	33.9	38.6	22.0	10.8	75.40	89.13	Iberian C	75.4	81.1
20.0	14.3	31.5	45.4	21.1	12.7	76.29	84.80	Mixed, Iberian A	71.8	79.7
18.9	14.0	32.0	43.7	21.0	9.9	81.40	90.90	Mixed, Iberian C	70.4	81.7
21.6	14.5	33.8	42.9	20.5	8.5	79.60	86.60	Mixed, Primitive, Alpine, Iberian A.	70.4	91.6
19.2	13.0	36.4	35.7	21.1	10.1	81.03	77.08	Iberian C, Iberian D	78.8	82.0
19.3	12.4	32.8	37.8	22.6	11.0	79.67	88.37	Iberian A, mixed	68.4	89.2
18.5	12.4	32.0	38.7	21.0	9.4	82.50	87.50	Iberian B, C, mixed	75.8	87.8
20.1	13.4	33.3	40.24	24.1	-----	87.50	82.00	Iberian D. (Cro-Magnon) odd type.	-----	-----
20.3	13.8	33.0	41.8	23.5	11.5	84.09	83.67	Iberian C, Primitive	74.0	86.3
20.2	14.0	31.3	44.4	21.8	9.9	88.43	75.51	Mixed	75.5	83.8
18.8	13.0	32.5	40.0	21.3	9.9	80.79	86.95	Iberian B	75.8	82.6
-----	-----	-----	-----	-----	-----	81.96	86.00	Mixed	73.9	83.4
-----	-----	-----	-----	-----	-----	78.00	94.49	Alpine	72.9	81.1
-----	-----	-----	-----	-----	-----	80.00	84.61	Mixed	74.0	82.7
21.2	17.2	28.0	61.4	24.4	-----	-----	-----	-----	-----	(?)
19.7	14.4	34.0	42.3	22.2	10.6	78.30	84.00	Mixed, Alpine, B. B. B., Primitive, Iberian A.	74.3	81.6
18.6	17.0	31.0	54.8	23.1	11.9	72.20	84.00	Iberian D	79.8	80.5

TABLE III.—*Averages and extremes—physical characters of adult males at Taytay, 1909—body measurements.*

Character.	Minimum.	Mean.	Maximum.	Number of individuals.	Mean of first 100 individuals.
Age	(2) 15.00	36.32	(3) 80.00	181	38.40
Stature	145.70	159.47	171.00	183	159.60
Sitting height	74.30	83.99	91.70	181	84.60
Pubic height	71.00	81.78	92.00	170	80.90
Umbilical height	85.00	95.75	105.60	170	95.70
Sternal height	118.00	128.88	139.80	170	124.60
Chin height	124.00	136.27	148.80	169	136.40
Ear height	134.60	146.10	158.50	169	144.40
Ankle height	4.40	6.52	8.20	169	6.60
Knee height	38.40	43.81	49.30	170	43.60
Trochanter height	72.80	83.08	95.30	170	83.20
Finger-tip height	46.50	57.04	66.80	169	57.50
Wrist height	68.80	74.65	85.00	169	75.10
Elbow height	87.50	97.69	110.50	109	98.00
Acromion height	117.40	129.59	139.80	169	129.40

TABLE IV.—*Head measurements of adult male Filipinos at Taytay, Rizal, Luzon, P. I., 1909—averages and extremes.*

Character.	Minimum.	Mean.	Maximum.	Number of individuals.	Mean of first 100 individuals.
Maximum length	16.60	18.30	20.20	182	18.33
Maximum breadth	13.40	14.96	16.50	182	14.96
Maximum height	11.20	12.47	13.60	182	12.32
Minimal frontal breadth	9.20	10.44	11.60	182	10.47
Bizygomatic breadth	12.00	13.77	15.00	182	13.78
Bimastoid breadth	11.40	12.91	14.30	182	12.85
Bigoniac breadth	9.10	10.69	14.30?	182	10.72
Naso-buccal distance	5.90	7.15	8.50	181	7.10
Naso-alveolar distance	5.30	6.47	7.50	189	6.40
Nose height (base)	1.80	2.86	4.00	181	2.80
Nose breadth	2.80	4.00	4.80	182	4.02
Nose length	3.70	4.71	5.70	182	4.70
Chin-nasion distance	9.30	11.20	13.00	178	11.20
Nasion hair-line distance	5.50	7.26	9.00	177	7.40
Mouth breadth (lips)	0.30	1.99	3.00	180	1.88
Mouth length	3.80	4.80	5.90	179	4.60
Ear breadth	3.00	3.51	4.10	182	3.57
Ear length	4.80	6.15	9.50	182	6.15
Ear cartilage length	4.20	4.96	5.90	182	4.99
Interocular distance	2.60	3.38	4.90	182	3.39
Eye length (transverse)	2.50	2.98	3.40	182	3.00
Eye color (Martin)	1.00	3.00	5.00	179	3.03
Frontal circumference	27.40	30.50	33.50	182	30.50
Parietal circumference	31.80	35.69	38.40	182	35.70
Forehead circumference	24.70	27.50	29.80	182	27.47
Occipital circumference	25.30	28.48	32.00	182	28.96

TABLE V.—*Indices and relative factors of adult male Filipinos at Taytay—averages and extremes.*

Factors.	Minimum.	Mean.	Maximum.	Number of individuals.
Absolute length:				
Lower leg	31.00	37.29	42.20	175
Upper leg	31.10	39.22	47.10	176
Hand	14.00	17.55	22.00	176
Forearm	18.30	23.05	27.90	176
Upper arm	26.50	32.37	38.00	175
Pubis to umbilicus	6.80	13.96	19.00	175
Umbilicus to sternum	27.70	33.14	38.60	175
Total head height	18.80	23.00	28.20	175
Upper face height	8.40	11.30	16.20	169
Relative length:				
Lower leg	20.70	23.87	27.20	175
Upper leg	20.70	24.60	27.46	176
Hand	8.56	11.05	15.71	176
Forearm	11.50	14.45	16.60	176
Upper arm	17.70	20.30	22.78	175
Indices:				
Omphalic	20.36	42.25	60.26	175
Cephalic	72.02	81.79	94.28	182
Nasal	54.90	85.20	110.00	182
Physiognomic	86.70	73.20	64.30	178
Morphologic face	93.30	81.30	66.10	178

II. DESCRIPTIVE CHARACTERS.

Time and exact appliances forbade the measurement of certain characteristics such as skin color and minor deformities, but notes were made of such occurrences and they are utilized in the following pages for purposes of description.

SKIN COLOR.

The Taytayan has a brown skin, the shade of which depends largely upon whether the individual is an outdoor or indoor worker. As the majority of men are fishermen or farmers, the skin is usually a darker shade than the average Filipino of Manila where so many men work indoors. The skin color is somewhat relative for this reason. However, a few individuals were so dark in color as to appear almost black, and a few more individuals were so light in color as to appear almost white. Of these there were six of the former and eighteen of the latter. The light-colored individuals invariably exhibited evidences of recent European extraction, whereas the dark colored were similar to the Indians of Cainta from whom they were probably derived.

HAIR.

The color of the hair is almost uniformly black and straight, with an occasional fine brown, but no notes were made in reference to this factor.

Only three individuals had wavy hair and these gave evidence of modified-Iberian characteristics. No association with the Negrito can be established from the hair form, and there is no evidence of any recent Negrito intermixture.

EYE COLOR.

The average eye color of 179 individuals determined with Martin's(17) artificial eyes is that of the intermediate brown No. 3, which occurred 74 times, a greater number than any other color. Number 1 occurred 18 times: in 6 Australoids, 7 Blends, 2 Iberians, 2 Cro-Magnons and 1 Alpine; and No. 5 occurred 16 times: in 8 Blends, 2 Alpines, 2 Cro-Magnons, 2 Australoids, 1 Iberian and 1 B. B. B. It may be significant that a greater number of Australoids and Iberians have dark eyes than light eyes, signifying an intensification of pigment due probably to the Iberian. I have referred before (4) to an intensification of skin pigment among Filipino Iberians, and this is hereby confirmed.

The condition of *arcus senilis* is prevalent and is not confined to old men.

Four blind individuals were noted among 183 men.

THE MONGOLIAN EYELID.

Observations were made on 116 individuals to determine the condition of the upper lid at the inner canthus, and only 10 were found with a well marked fold at this point, whereas 63 were found without the fold, and 43 had only a slight indication of it.

If this fold is a sign of Asiatic blood as distinguished from European and others, then almost half the individuals examined give indications of Asiatic extraction. However, this proportion is probably not true, but those individuals who have only a slight fold have no doubt as much other blood as Asiatic. Therefore the relative proportion of European and others to Asiatic should be as the ratio of 63 to 10, or 63 plus ½ 43 to 10 plus ½ 43, which is a ratio of 84.5 to 31.5, or somewhere between the two ratios.

When the types (species) are correlated with the three conditions of eyelid, not one type can be excluded from the Mongolian, but each type has some individuals with this condition as may be seen in the table below:

	Blend.	Australoid.	Iberian.	Cro-Magnon.	Alpine.	Modified primitive.
Straight	36	12	8	3	4	0
Slight Mongolian	24	8	0	4	4	3
Mongolian	5	2	2	1	0	0

Some types, however, have a greater number of straight upper lids, whereas others have the fold in greater number. Thus the Australoid and the Iberian have a greater number of individuals with straight lids, whereas the Alpine, Modified Primitive, and Cro-Magnon have a greater number with Mongolian lids, and the Blend has almost an equal number of each. May it be inferred from this that the Australoid and Iberian are other than true Asiatic types, whereas the Cro-Magnon, Alpine, and Modified Primitive are true Asiatics, also that each type is represented among the Chinese? None of the Primitive or B. B. B. were examined for lid formation.

HEAD OUTLINES.

Composite outlines of the three groups, brachycephalic, 74 individuals, mesocephalic, 69 individuals, and dolichocephalic, 22 individuals, are made in the same manner that similar outlines were made for the Igorots, negroes and white students described in former studies (3).

There are two dolichocephalic outlines because so few individuals did not produce one composite, there being enough large outlines to make an additional composite outside of the one where the greatest number produced the small outline.

A glance at the outlines (figs. 5, 6 and 7) will show the dorsal flattening marked in the brachycephalic, which at once differentiates the Taytayans from the Igorots, negroes or white students. This flattening in the brachycephalic (fig. 5) is accompanied by projection in the parietal region, prominence in the region of the bregma and bulging in the temporal region, which suggests artificial flattening by pressure from behind. Many of the heads were flattened toward one side rather than exactly in the middle, and when this condition existed the opposite side bulged in the parieto-temporal region more than the side on which the dorsal flattening was most marked. (See Plate XVIII.)

In several children this was more decided than in adults. One of these is given in fig. 8 where the two outlines are shown as taken with the cephalograph over the middle of the right and of the left eye respectively and parallel to the median line. Another is shown in fig. 9, with the median sagittal outline and one parallel to it 3 centimeters to the left. The first of these is of a boy, aged 4, whose father brought the child to me for consultation. The boy had slept invariably with his head on a hard board covered with only a thin matting, the *petáte,* with the head turned to the left at an angle of 45°, and I attributed the trouble to this cause. The head of the second boy, aged 10, was not so distorted but without doubt the condition was due to the same cause. These two cases illustrate a condition that is found frequently among the children and I believe it is nothing more nor less than the *petáte habit* that produces it.

The *petáte habit* is what I named the Filipino custom of sleeping on

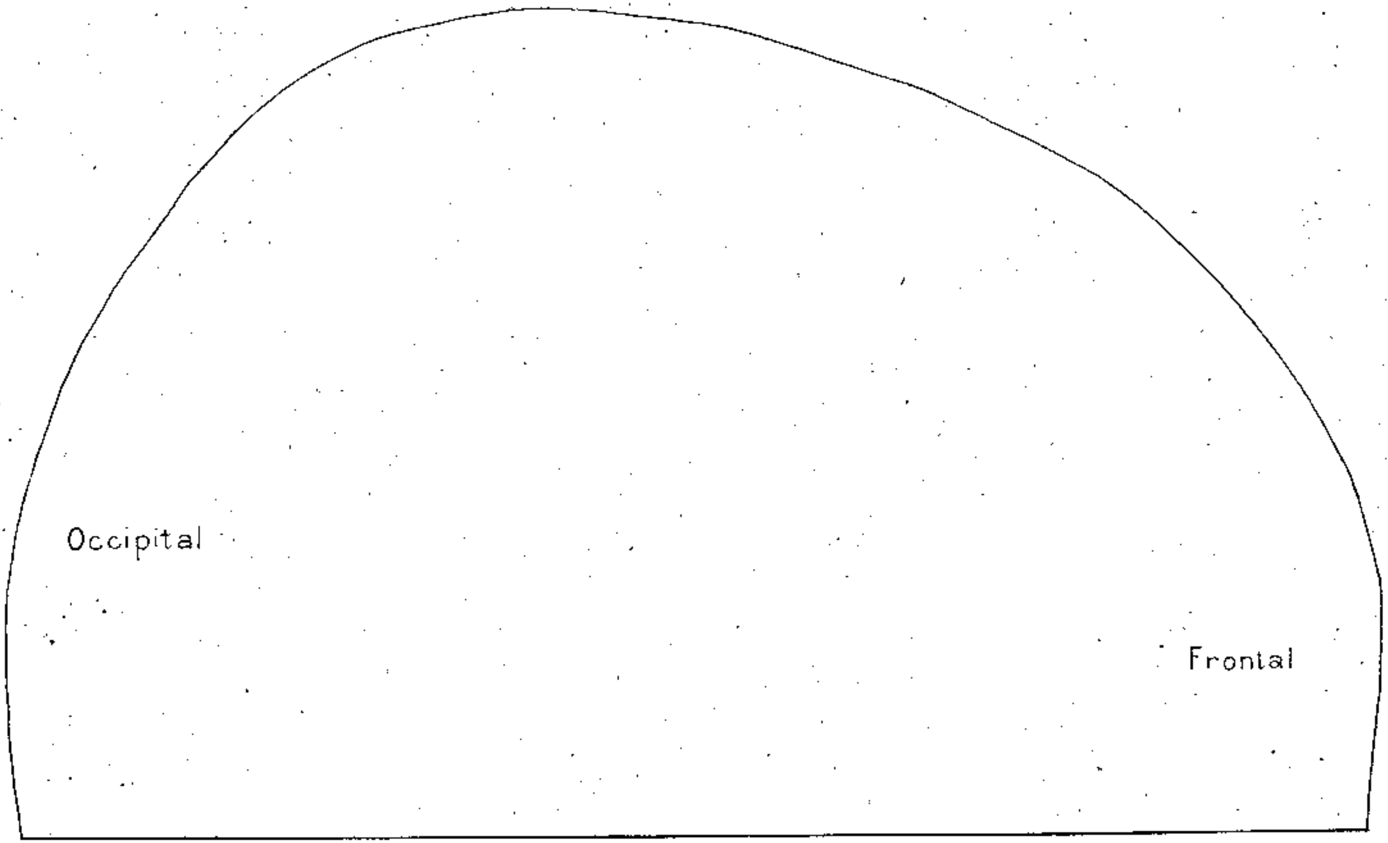

FIG. 5.—COMPOSITE OUTLINES OF 74 BRACHYCEPHALIC INDIVIDUALS.

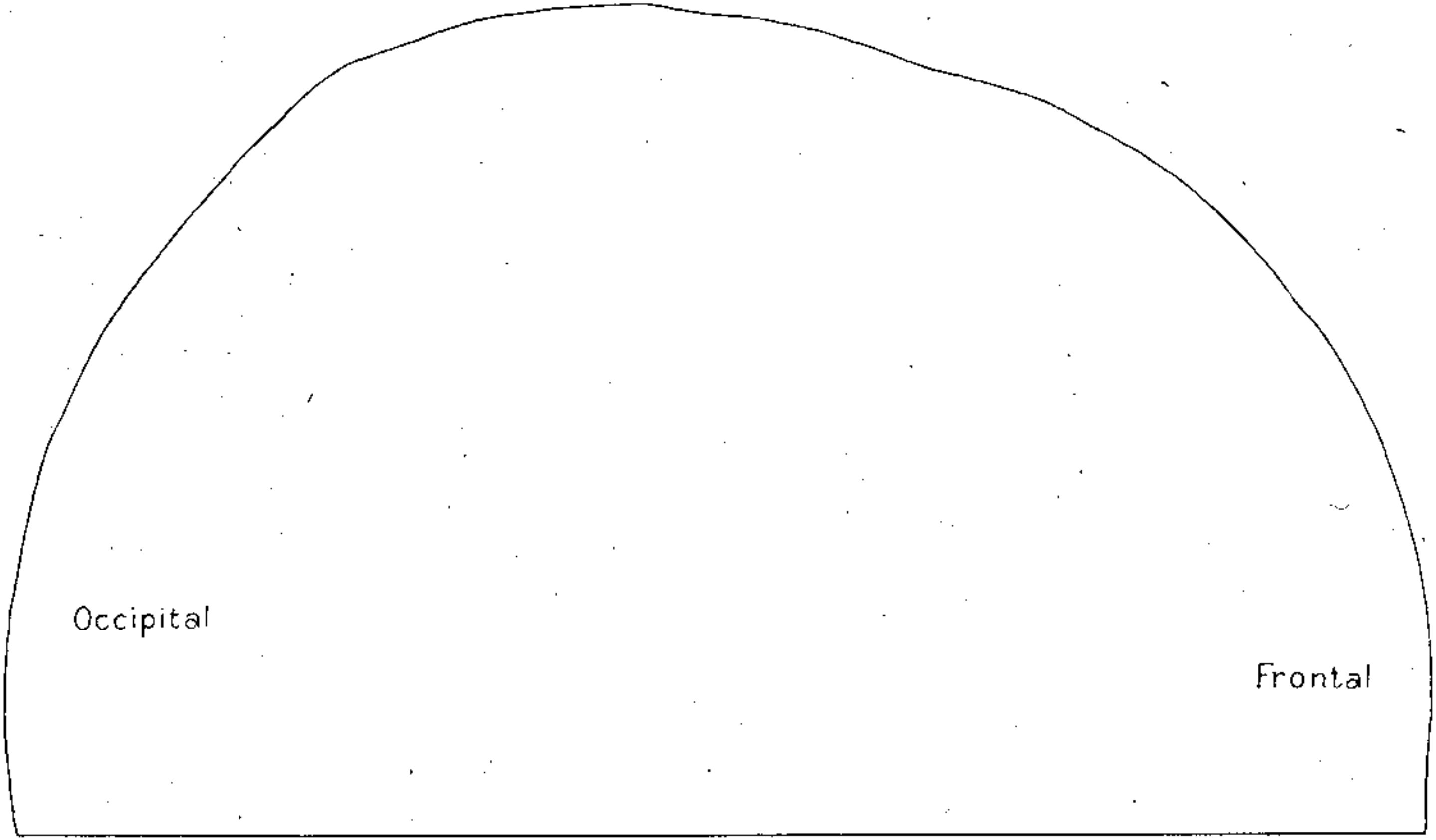

Fig. 6.—Composite Outlines of 69 Mesocephalic Individuals.

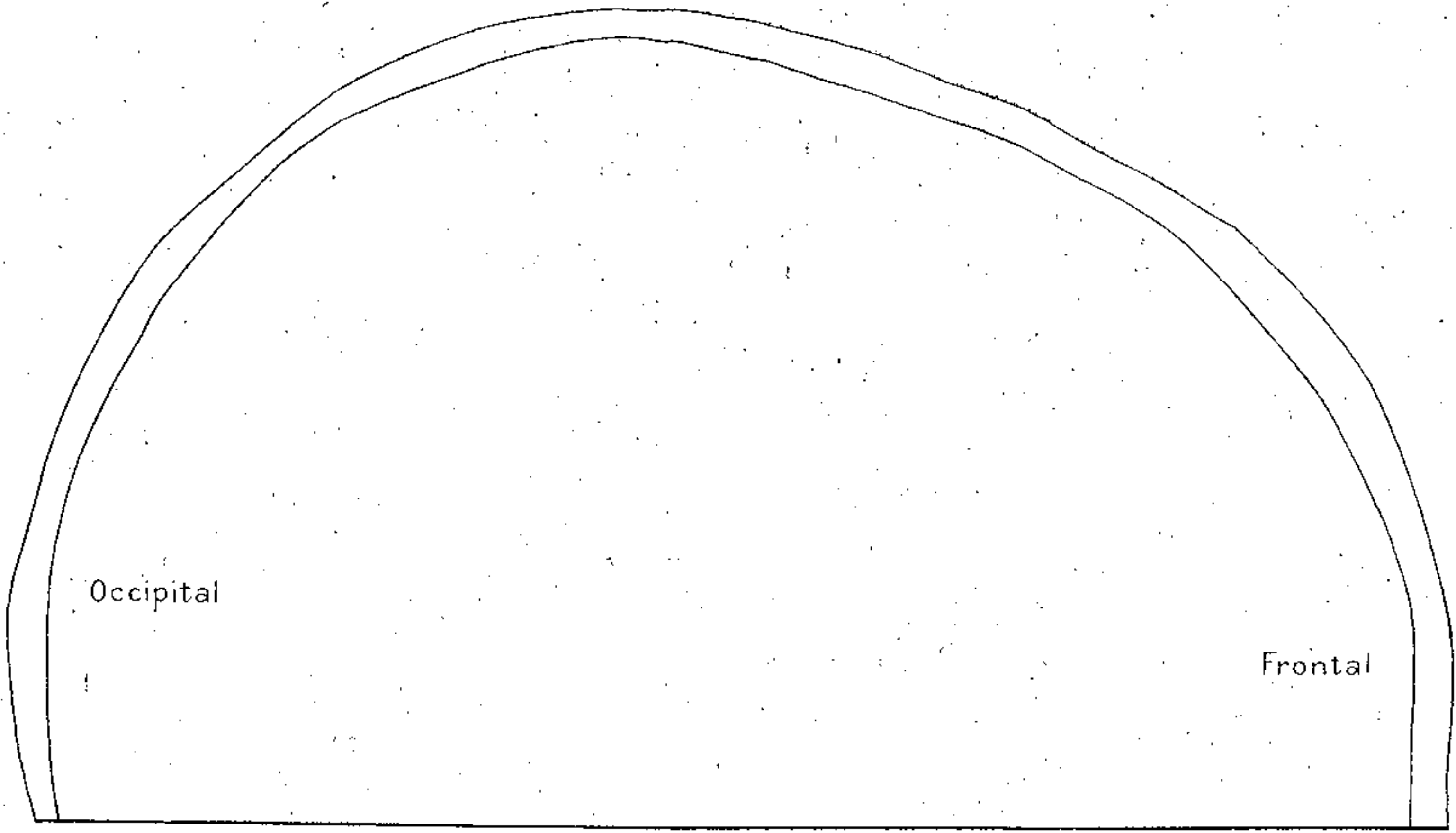

Fig. 7.—Composite Outlines of 22 Dolichocephalic Individuals.

hard floors (bamboo or other material) with only the *petáte* or a small hard pillow between the head and the floor. This is the coolest way to sleep in the tropics, the soft pillow being particularly hot and oppressive. When the baby is placed upon a *petáte,* in acquiring the habit it normally lies flat upon its back and the head is either straight or turned slightly to one side. After a few months a flat place is formed on that part of the head resting on the *petáte,* and the child then lies on this flat place until the head becomes misshapen and sometimes badly deformed.

When my daughter was about one or two months old we kept her in a woven bed with only a sheet and a *petáte* beneath her until about the third month when I noticed a small flat place in the occipital region of the head, after which we used a small pillow and the head soon resumed its normal dorsal rotundity.

This matter is a subject of great interest and may be one of vital importance because such deformities may result in impaired mental ability by undue pressure and distortion of the brain when it is developing most rapidly. We would therefore suggest that a study of the school children be made by the teachers in the public schools, using the cephalograph(7) originated by Doctor Bean, one of which is owned by the Bureau of Education. The teachers are probably the only ones who can control the children sufficiently without the aid of the parents so that their head outlines can be made. Records should be kept showing the physical and mental condition of the child and from time to time the head outlines should be made, the parents having been instructed previously about the proper head rest for their children. The teachers may be able to induce the youngest children also to have their head outlines made in order that the study may begin in the cradle, or rather on the *petáte,* at which time the most good can be accomplished.

If the deformed condition of infancy persists during the adult life of the individual, then otherwise dolichocephalic or mesocephalic heads become mesocephalic or brachycephalic, and a part at least of the brachycephally and mesocephally of the Orient is not natural.

The vertical occiput and the *front bombé* may be only deformities and not racial or true morphologic characteristics. For this reason, I believe the cephalic index is not the best differential factor although it still may be of some service and should not be discarded entirely, but relegated to a subordinate position in racial anatomy.

Forty-two heads of Taytayans give evidence of dorsal flattening to a noticeable degree, and among these greatly distorted heads are included all those of the Primitives, 6 of the Australoid, 1 B. B. B., 1 Adriatic, 6 Iberian Blends (Alpine), 5 Primitive Blends (fig. 10), 3 Adriatic Blends, and the remainder are Blends of various sorts. In connection with the ear type, it is of interest to note that 13 of the 42 flat heads had ears of the odd type, although 16 odd type ears were not

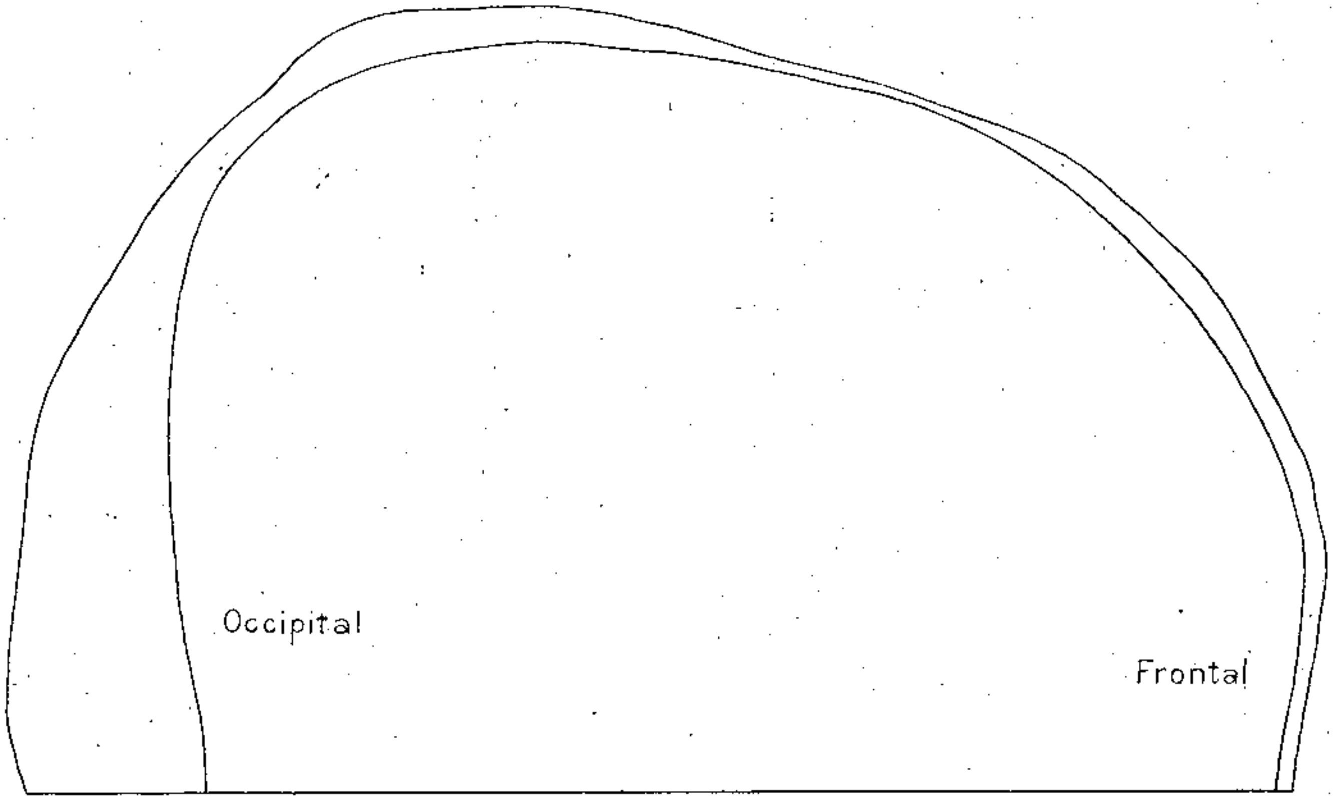

Fig 8.—Boy of Taytay Aged 4. The Small Outline is From the Left Side of the Head Over the Middle of the Eye. The Large Outline is From the Right Side of the Head a Little Nearer the Median Line.

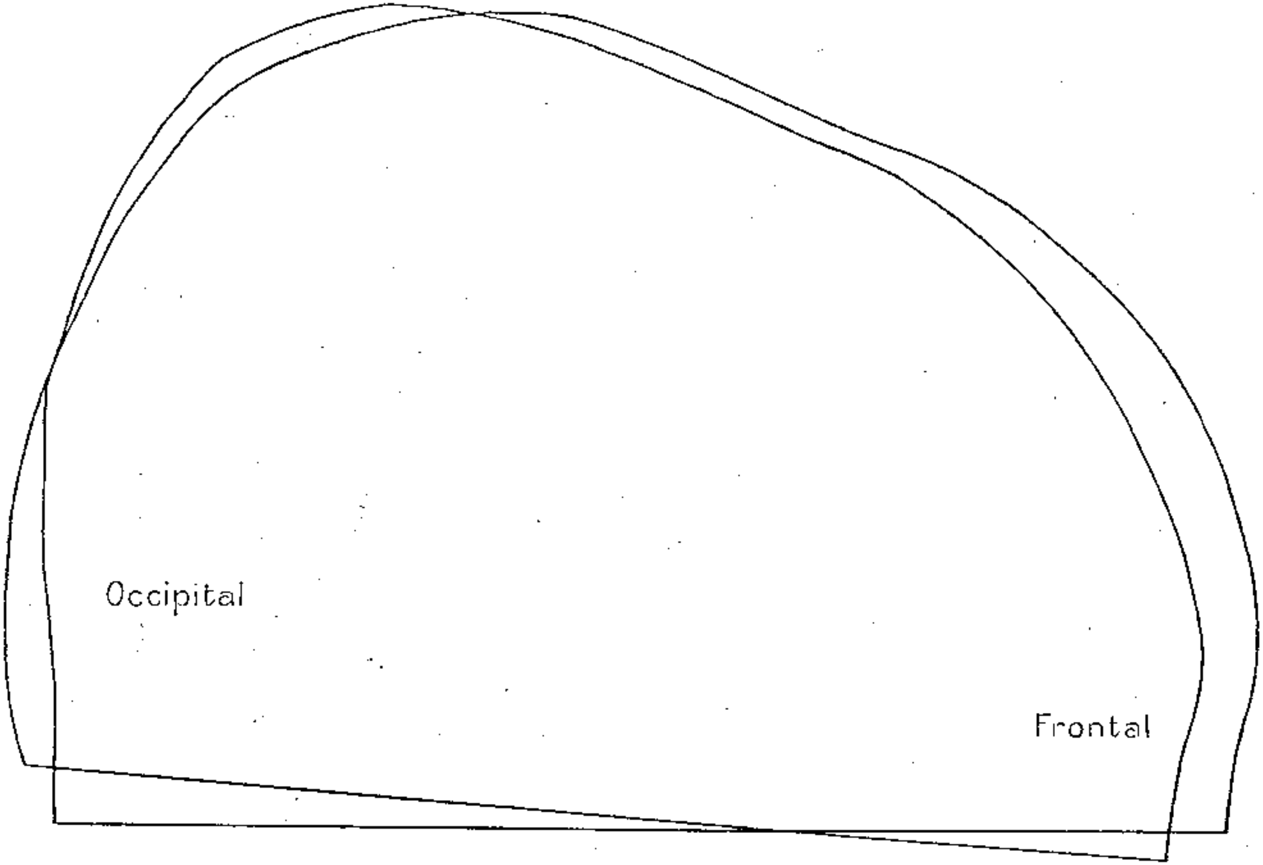

Fig. 9.—Boy of Taytay Aged 10. The Short Outline is 3 Centimeters to the Left of the Midline. The Long Outline Circumscribes the Sagittal Plane.

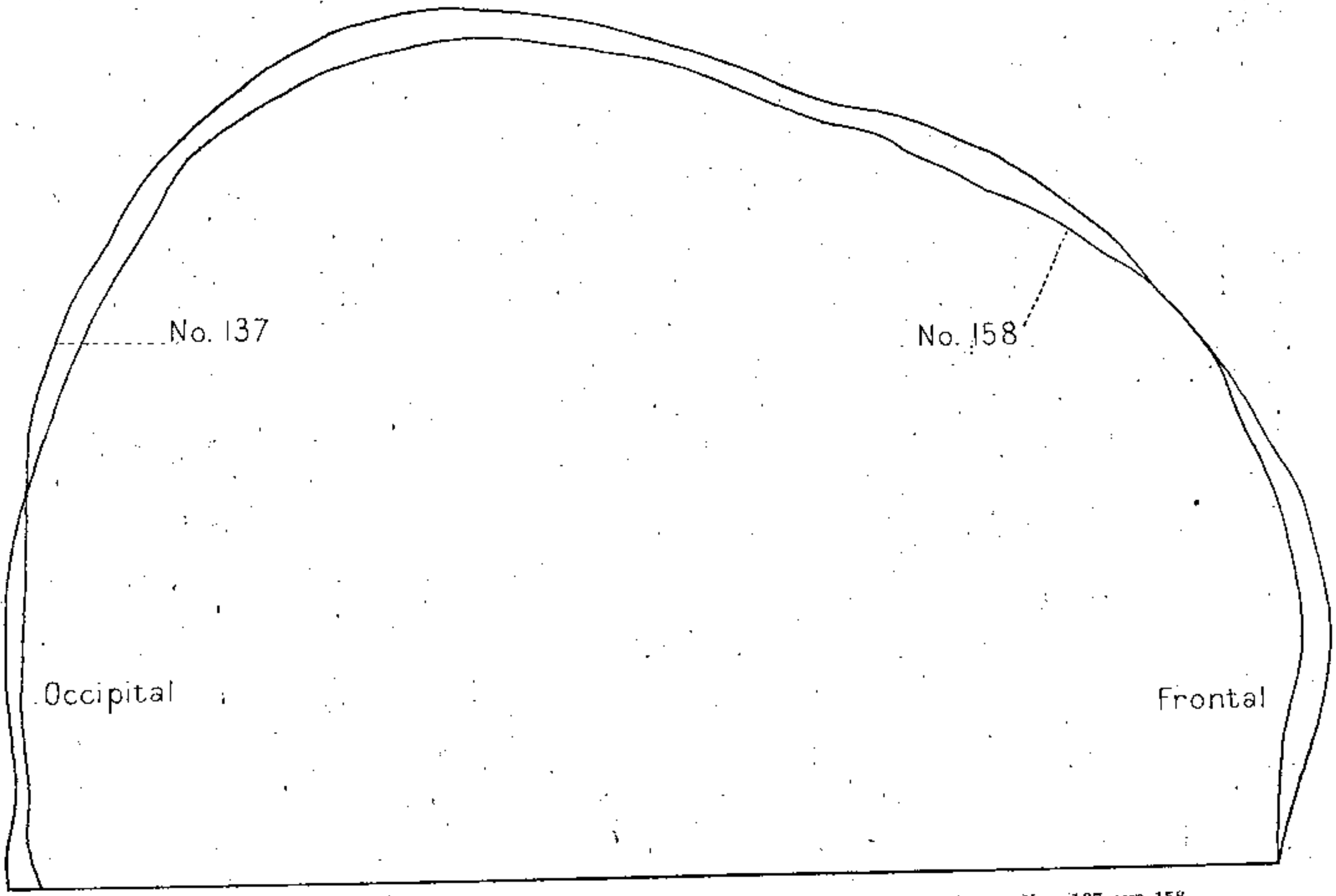

Fig. 10.—Head Outlines of 2 Primitive Blends With Flattened Occipital Region. Serial Nos. 137 and 158.

associated with dorsal flattening of the head. The individuals previously noticed with this ear type were distinguished by the flat occipital region. The questions immediately arise: Is the flat occiput a type of head or is it a deformity? Is the odd type ear a true type or is it due to the deformed head? The two are evidently closely associated, but what do they represent? The occurrence of the flat head with the Primitive and related types may be urged in favor of the odd type entity represented by the Primitive and its allied forms, and the absence of the flat heads among Cro-Magnon and Iberian favors this view. On the contrary, the flattening of the head increases the cephalic index and thereby types are classified as Primitive or related forms that would be otherwise different types because the cephalic index is the basis of the classification. For the same reason, neither the Iberian nor the Cro-Magnon have any flat heads, because if they did the cephalic index would be increased and they would be no longer Cro-Magnon or Iberian. The cephalic index should be replaced by some other factor in the differentiation of the types, or some other factor should be utilized in conjunction with it as the basis of the classification.

Therefore we have utilized the ear form in connection with the cephalic index, nasal index, and stature in an additional classification which is to be given when the ears are studied.

ADDITIONAL OBSERVATIONS.

Eleven left-handed individuals occurred among 175 observed, and this in spite of the fact that it is considered unfortunate to be left-handed and some stigma is attached to the condition. One square, box-shaped head suggesting previous rachitis was observed, and one platycnemic tibia (saber shin) was seen. Two cases of wry face (unilateral facial paralysis) were noted. One case of scaphocephaly (Plates I and IV) and one hare lip were seen.

The box-headed individual mentioned above, Serial No. 149, clinical No. 875, also had odd fingers. The lengths from the web to the tip of the fingers is given here:

	Right hand.	Left hand.
	cm.	*cm.*
Thumb	5.5	6.0
Forefinger	9.0	7.0
Middle finger	8.7	10.3
Ring finger	8.2	9.0
Little finger	7.7	7.5

The right forefinger is long and the left is short; and the middle finger and ring finger of the left hand are longer than the same fingers of the right hand. Apparently no bones are absent, and no history of similar deformities in the family could be obtained.

A peculiarity of the bones of the skull in the form of a ridge on the bone about the size of the finger and extending from mastoid to mastoid around the occipital region, was noted frequently; in two persons, both of the Iberian type, it was well marked. This ridge apparently followed the superior curved line and crossed the external occipital protuberance, terminating on each side in the mastoid process. It occurred on 12 Iberians, 3 Blends, 2 Australoids, 2 Alpines, 1 Cro-Magnon and 1 B. B. B., 21 times in all. The accompanying head outline illustrates this projection over the occipital protuberance, which itself was not large but seemed continuous with the ridge (fig. 11). Future studies of skulls may reveal the nature of this abnormality, because it was not superficial but appeared to be bony in character.

III. THE SEGREGATION OF TYPES.

In previous papers concerning the Filipino Types found among the Manila Students(4) and in Malecon Morgue(5), the suggestion was made that the types represent species, of which there are elementary or new, and systematic or old, present in both groups of individuals as well as among the Igorots and Japanese. The Primitive and Iberian are called systematic species, the Alpine, B. B. B., Modified Primitive, and Adriatic, elementary species, and the Australoid and Cro-Magnon, systematic species also, but not so definite as the Primitive and Iberian. The reasons for this classification and for the use of the word species have already been given in relation to Schulls'(4) work on corn, and the work of Price and Drinkard on the tomato(4).

The species of men at Taytay may be selected by the same method used to select those of the students and in the morgue. The species so selected are then differentiated as follows:

The Primitive is brachycephalic, platyrrhine, and small in stature.

The Iberian is dolichocephalic, leptorrhine, and below medium size.

The Australoid is dolichocephalic, platyrrhine, and small or below medium size.

The Cro-Magnon is dolichocephalic, platyrrhine, and above medium stature.

The Alpine is brachycephalic, leptorrhine, and below medium size.

The B. B. B. is brachycephalic, leptorrhine, and above medium size.

The Modified Primitive is brachycephalic, platyrrhine and below medium stature.

The Adriatic is brachycepahlic, platyrrhine, and above medium stature.

The Blend is moderately brachycephalic, moderately platyrrhine and small in stature, corresponding with the Primitive and Modified Primitive more nearly than with any other type.

THE PRIMITIVE.

Only three individuals of this type were observed among the men at Taytay, although a majority of the Blends conform to the Primitive. The three men are characterized by a stature of 150.1 centimeters, a cephalic index of 88.5 and a nasal index of 89.1, in addition to which may be given the morphologic face index 78.5, the omphalic index 44.1,

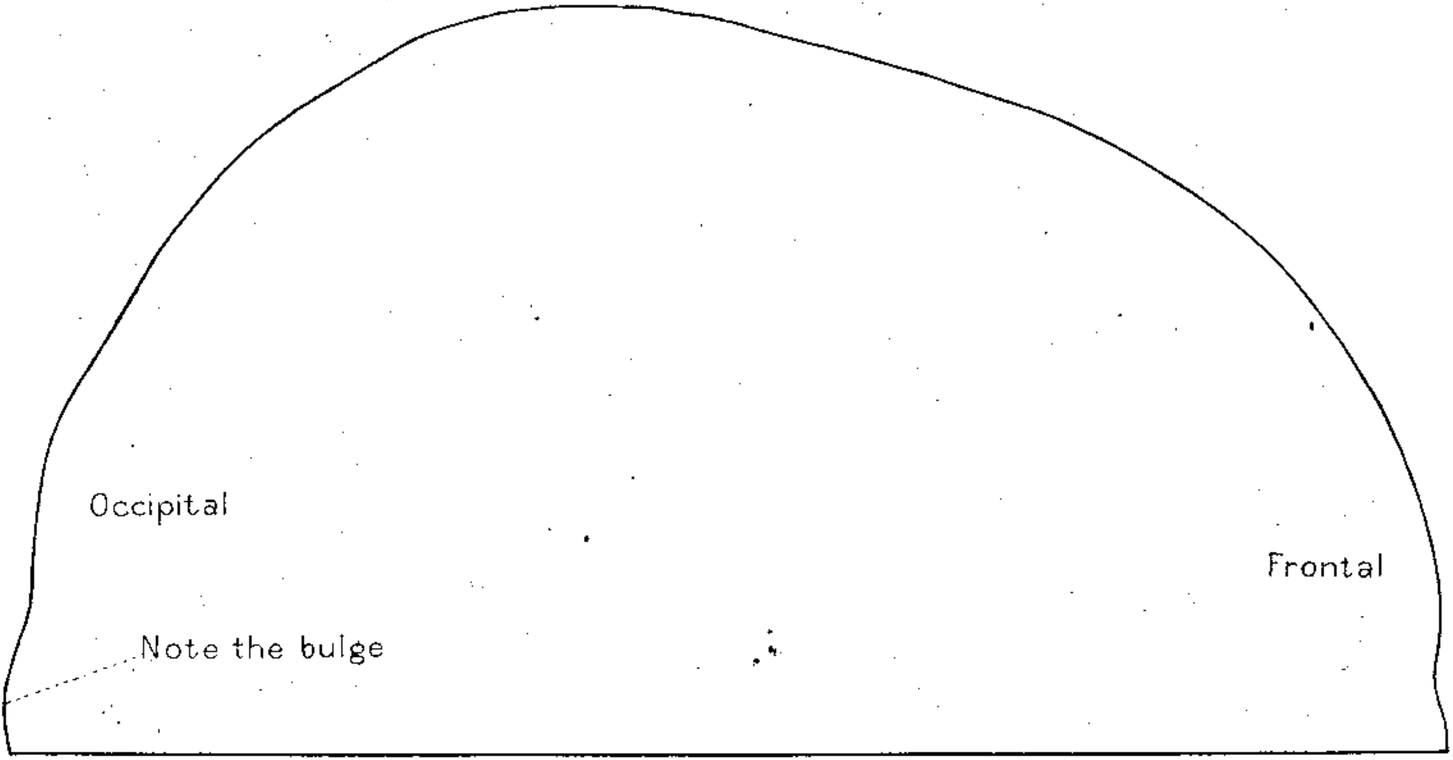

FIG. 11.—HEAD OUTLINE SHOWING AN UNUSUAL BONY BAND ABOUT THE OCCIPUT.

the tibio-femoral index 92.6, the radio-humeral index 73.7, and the intermembral index 75.5. Other characters need not be mentioned because they are neither distinctive nor differential in nature.

Type N of the Igorots has a stature of 150.8, a cephalic index of 84.3, and a nasal index of 89.4 which indicates a close relationship to the Primitive of Taytay. They are practically identical with the Primitive of the Manila Students and of Malecon Morgue, although relatively fewer individuals of this species are found at Taytay.

Character.	Maximum.	Mean.	Minimum.	Number of individuals.
Stature	153.6	150.1	147.1	3
Absolute lower leg length	35.5	33.6	30.7	3
Absolute upper leg length	39.2	36.3	31.1	3
Absolute forearm length	25.3	22.4	20.6	3
Absolute upper arm length	31.3	30.4	30.0	3
Omphalic index	56.5	44.1	37.0	3
Cephalic index	93.4	88.5	83.3	3
Nasal index	95.3	89.1	83.0	3
Morphologic face index	80.8	78.5	74.3	3

Attempts were made to obtain photographs of one or more Primitive men, but unfortunately the individuals could not be prevailed upon to submit to the ordeal of sitting for their portraits, therefore descriptive characterization and measurements must suffice. However, a few photographs of the Primitive type as found among the Moros, Igorots, and other peoples of the Islands are taken from the Bureau of Science collection for purposes of inspection and comparison. These may be seen in Plates II to VI.

The head outline from glabella to inion of a Primitive man, Serial No. 110, is given in fig. 12 with that of an Iberian for comparison. The depression of the lambda and the elevation of the bregma are very noticeable, and the *front bombé* is exaggerated. The head is short and high. Whether or not this is due to pressure on the occipital pole can not be known. It is possible that pressure on the occipital bone after it is thoroughly ossified would produce a depression of the lambda. There is the counterbalancing elevation of the bregma and the frontal region, although the three characteristics may be normal. It is a question whether the Primitive is a species or type, or whether it is a condition due probably to malformation of the head during infancy.

The individuals are small, with small round head (A 19), broad, flat, short face and nose, lips full but small, chin small and somewhat receding, forehead narrow but bombé (15), and directed almost vertically from

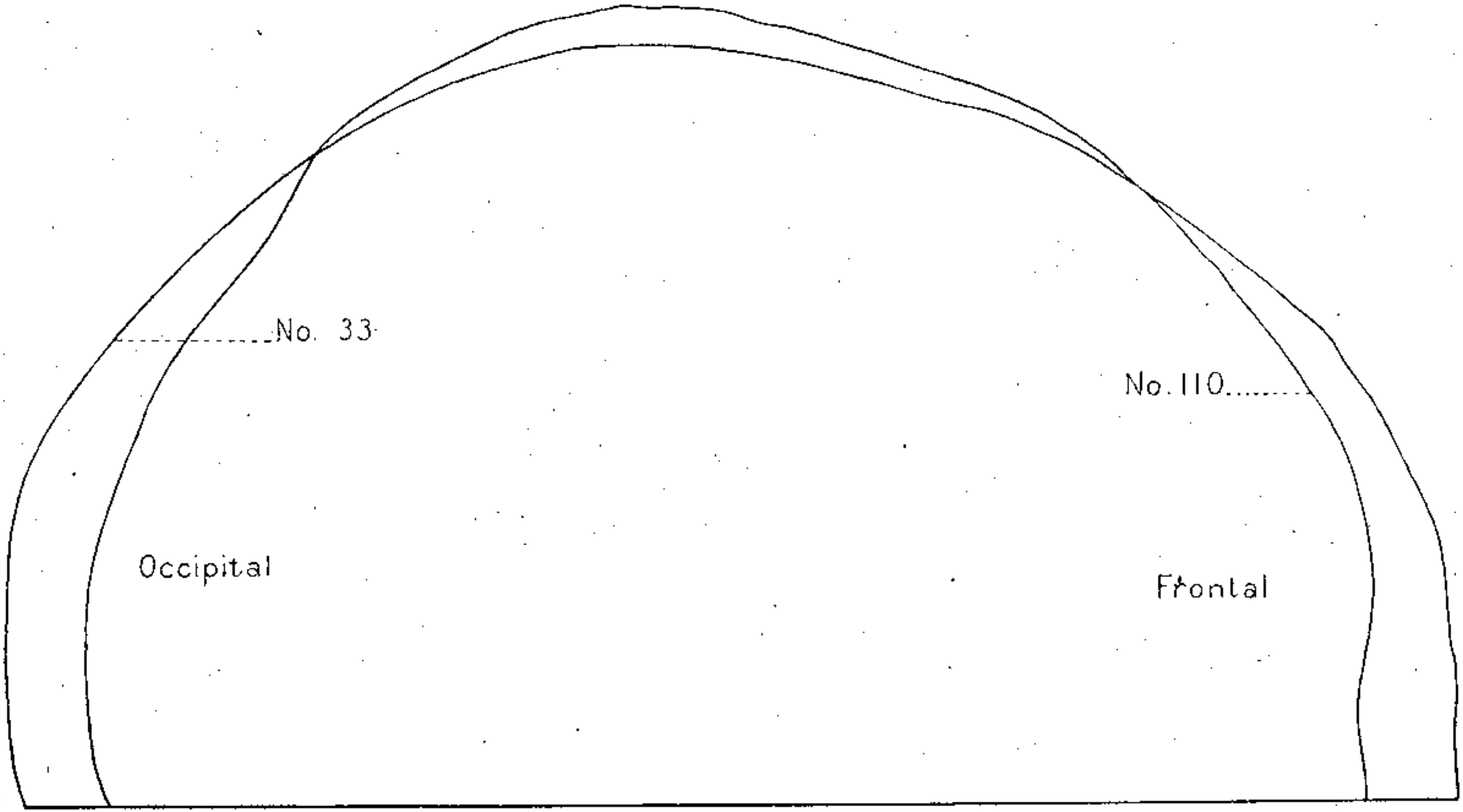

Fig. 12.—Primitive and Iberian Head Outlines. Iberian Serial No. 33. Primitive Serial No. 110.

the brows which are not prominent but somewhat flattened. In truth the type is infantile(26).

It is easily associated with Hagen's(12) "*infantile Gesichts Bildung*": "*niederes Gesicht, stumpfe, breite, niedere Nase, breite, wenig erhebene Nasenwurzel dann Neigung zur sogenannten mongolenfaltenbildung der Augenlider, vorwölbte Stirn, die sogenannte Front bombé.*"—"*so haben wir einen ziemlich umfangreichen Komplex von Merkmalen, innerhalb dessen sich die Zusammenhängen und Gemeinschaftlichkeiten der aus den heutigen Menschenrassen herauszuschalenden Urform bewegen müssten, wenn diese wirklich auf den Namen einer 'primitiven' anspruch haben soll.*" However, Hagen includes the Senoi, the Aeta, the Indian of South America, the Papuan, the Veddahs of Ceylon, the Battaks of Sumatra, the negro of Guinea and the Bushman of Africa under the term "*primitiven,*" some of whom are dolichocephalic and others brachycephalic; therefore, it is evident that more than one somatologic type is included in his "*primitiven.*"

The Primitive of Taytay conforms in bodily dimensions to a type of Negrito found in the Philippines and to types found in other Asiatic island groups, as well as on the mainland in the Malay Peninsula(4). The Kubus of Sumatra(37), the Taradjas of the Celebes(24), the Semangs and Senoi of the Malay Peninsula(18), the Orang Akett of Sumatra(19) and the Veddahs of Ceylon(18), have in their composition a form similar to the Primitive. This form has almost invariably associated with it another which I call the Australoid, the chief differences being that the latter has a dolichocephalic head and a wider nose than the Primitive(32).

THE AUSTRALOID.

There are two forms of the Australoid, one a *primary,* or remote, the other a *secondary,* or recent; the first found among the Igorots, the second among the students and morgue subjects. Physical measurements do not differentiate them, except that the more recent is taller. Very few of the *primary* appear among the men of Taytay, but among the women more are found. However, a few men are noted with stature about 150 centimeters and with very wide nose and narrow head. No photographs could be obtained of these *primary* Australoids because of their shyness, or aversion to having their picture taken; an indicator, as in the Primitive, of elemental nature. Snap shots of other Australoids were taken with the only camera at hand, a Brownie pocket kodak, but the pictures are not reproduced on account of their poor quality.

The man represented by Serial No. 89, Clinical No. 564, resided some distance from Taytay, but came to be treated at the dispensary; he was probably suffering from sexual neurasthenia. His features are large and heavy except the lower jaw, which is short, square and receding. The brow ridges protrude, the cheeks are large and prominent, the nose is wide, straight, heavy and depressed at the nasion, and the lips are full and thick. The brow ridges are noticeably prominent. This is a form somewhat apart, although one other was noted like him, and it is a not unusual Filipino type. It is nearly related to the remains of the earliest paleolithic man (Homo Heidelbergensis—Homo Mousteriensis) recently discovered in Europe, if indeed it is not exactly the same form(15).

The upper lip is broad from its border to the nasal spine, a distance of 2.7 centimeters, although broader lips are seen. The peculiarity is in the rounded contour between the nasal spine and lip margin as seen in profile. The facial angle 70°—glabella, nasal spine, external auditory meatus—is not greater nor less than many others, although it is 7° to 8° less than that of the Igorots measured in the same way. Nevertheless, about 30 per cent of the Igorots have the same index and 4 per cent an index less than 70°. The nasal index is 73.68, the cephalic index is 102.2, and the stature is 156.8. The head height is 12.5 centimeters. The ear is similar to the odd type previously described. The physical characters of this man resemble those of the Taytayan Cro-Magnon, but the stature is much less and other factors as well differentiate the two. The sagittal head outline is of sufficient interest to be given (fig. 13). It is low, long, and somewhat flat over the lambda. The forehead is not high, and the glabella is prominent. The occipital region is full but not projecting, although the occipital circumference is 2 centimeters greater than that of the forehead. The outline might very well represent an Iberian and Primitive combined.

Another man of similar form is represented by Serial No. 103, Clinical No. 616, and although the stature of this man is 12 centimeters greater than that of the other there is a similarity in many respects that associates the two forms. Both of these men belong rather to the Cro-Magnon than to the Australoid group because of greater stature, straight nose, wide, long face and prominent occipital region, but they also partake of the Australoid characters.

They are not secondary Australoids, however, which are represented by two other men whose photographs were obtained without difficulty. (Plates I, XVI, and XVII.) These two men show evidences of recent Iberian mixture, but retain the Australoid characters to some extent.

Character.	Maximum.	Mean.	Minimum.	Number of individuals.
Stature	164.3	158.01	149.5	37
Absolute lower leg length	40.4	37.00	33.0	33
Absolute upper leg length	43.0	38.04	33.3	33
Absolute forearm length	25.7	22.60	19.5	33
Absolute upper arm length	36.4	32.11	29.5	33
Omphalic index	55.9	41.40	26.2	32
Cephalic index	83.3	78.00	72.0	35
Nasal index	102.2	93.30	84.0	35
Morphologic face index	93.3	82.30	70.9	34

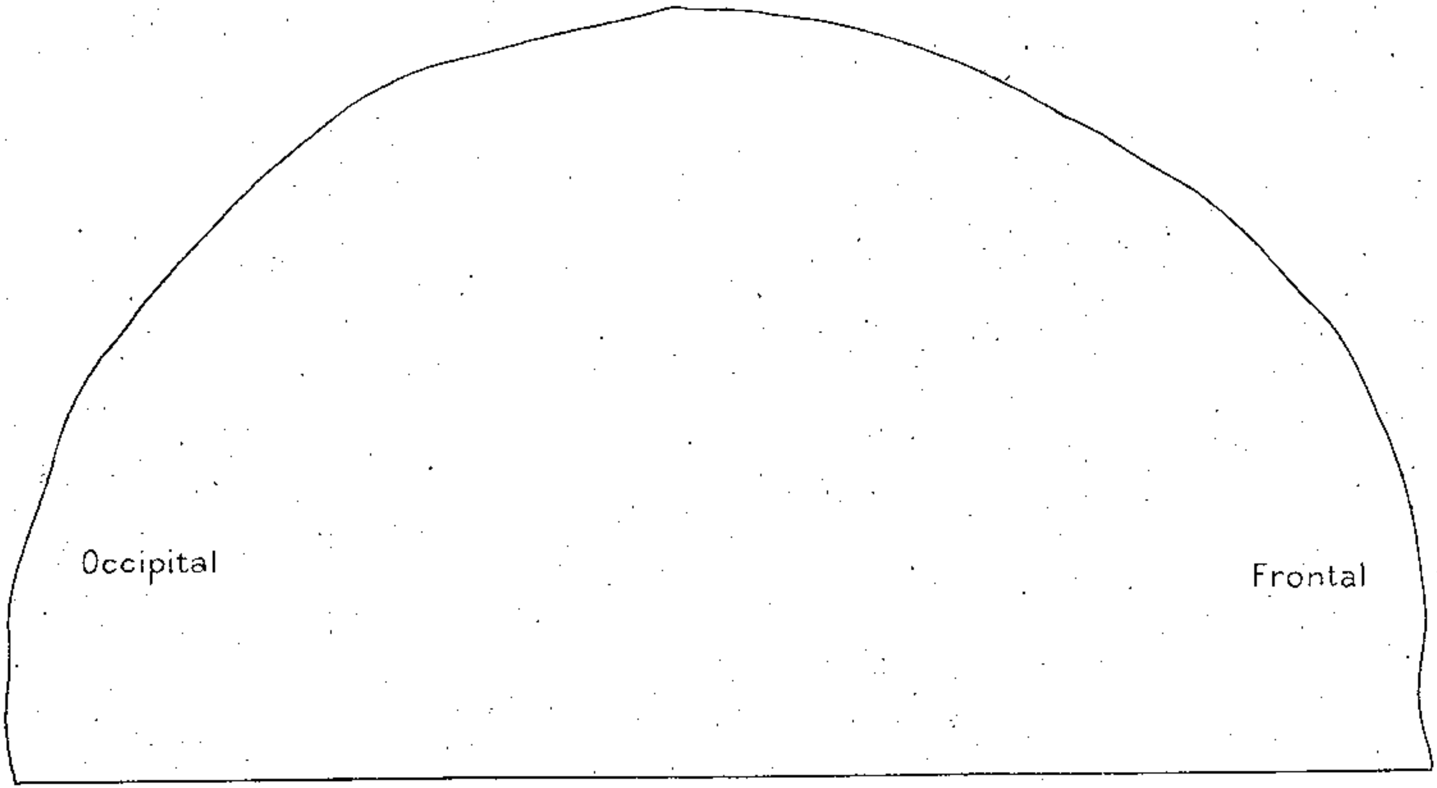

FIG. 13.—AUSTRALOID HEAD OUTLINE. SERIAL NO. 89. CLINICAL NO. 564.

The mean stature of 37 Australoids of Taytay is 158.0 centimeters, the cephalic index is 78 and the nasal index 93.3. The morphologic face index is 82.3, the omphalic index is 41.4, the radio-humeral index is 70.4, the tibio-femoral index is 97.3 and the intermembral index is 72.9. Compared with the Primitive, the stature is greater, the head is narrower, the nose is wider, the face is higher, the umbilicus is lower, the forearm is shorter, the lower leg is longer, and the lower extremity is shorter. The form is intermediate in general, between the Primitive and the Iberian.

The stature of the Australoids of Taytay is 0,7 centimeters less than that of the Morgue Australoids, 11.5 centimeters greater than that of the Igorots, 2.9 centimeters less than that of the students, 5.75 centimeters less than the Japanese previously measured. The cephalic and nasal indices of all groups are practically identical—dolichocephalic or slightly mesocephalic, and platyrrhine—except that of the Igorots who are frankly dolichocephalic, and markedly platyrrhine. The Igorots are the *primary* Australoids, whereas the other groups contain Blends that simulate them, and represent recent mixtures of the Filipino Iberian and Primitive, both of which are somewhat blended.

The physiognomy of the *primary* Australoid resembles that of the Senoi, the Aeta, the Battak, the Veddah, and the Indian of Peru, as given by Hagen, whereas the physiognomy of the *secondary* Australoid represents distorted Primitive and Iberian. For purposes of comparison the Iberian will be described next.

The Iberian.

Character.	Maximum.	Mean.	Minimum.	Number of individuals.
Stature	169.3	**160.7**	154.5	17
Absolute lower leg length	40.6	**37.6**	33.3	15
Absolute upper leg length	43.6	**39.9**	36.4	15
Absolute forearm length	26.0	**23.3**	20.9	15
Absolute upper arm length	36.6	**32.9**	28.8	15
Omphalic index	52.8	**42.9**	33.5	15
Cephalic index	79.0	**76.2**	70.5	15
Nasal index	85.4	**78.5**	72.0	15
Morphologic face index	91.6	**84.8**	73.1	15

The stature of 17 Iberians is 160.7 centimeters, the cephalic index is 76.2 and the nasal index is 78.5. The omphalic index is 42.9, the morphologic face index is 84.8, the radio-humeral index is 70.8, the tibio-femoral index is 94.2, and the intermembral index is 72.5. Comparing this with the Australoid and Primitive, it may be said that the Primitive and Iberian have blended to produce the Australoid in stature, face height and width; the broad nose of the Primitive has been retained and is somewhat broader; and the cephalic index and limb and body measurements of the Iberian have been retained to some extent. The tibio-femoral index of the Australoid is greater than that of the Iberian or Primitive.

The stature of the Iberian of Taytay is but little less than that of the student Iberian, or the Iberian of Malecon Morgue, and is the same as the Japanese Iberian. The cephalic index is practically the same in all groups although the Japanese are slightly more dolichocephalic than the others. The nasal index is also about the same in all the groups, although the 5 Morgue males have an index of only 68.14, but the flare of the nostrils may not be so great in death as in life, which may account for this.

The fact is significant that the Iberian is present in all the groups of Littoral Filipinos so far observed, and is also found among the Japanese and Igorots. It can easily be accounted for among the Filipinos, through recent European (Spanish) immigrants, but an earlier migration from Europe must have occurred to have impregnated the Japanese and Igorots. The alternative is that the Iberian is a fundament of primary man and is found as an element in all the groups. Keane's hypothesis of the eastward migration of the early Europeans explains their presence in the heart of Luzon and in Japan. A northern branch reached these Islands, while the main body pushed on through the central Pacific to Hawaii. This is substantiated by a study of the ears of the natives throughout the Philippines, which has been undertaken and will be rapidly prosecuted.

For the purpose of illustrating the different Iberians, examine Plates I, and VII to XII. The different Iberian types will be discussed when the ears are described.

The sagittal outlines of two Iberian's heads are seen in fig. 14, and the two are almost identical. One, however, is slightly flattened in the occipital region. (See also fig. 12.) These outlines may be studied best by comparison with the outlines of the heads of two Primitive Blends in fig. 10. The forehead of the Iberian is almost vertical, that of the Blend is bombé; the occipital region of the Iberian is full and rounded, that of the Blend is vertical and flat; the parietal region of the Iberian is well rounded, whereas that of the Blend is prominent and bulging; the bregmatic region of the Iberian is almost flat, whereas that of the Blend bulges, especially in the superior frontal region. There is evident distortion by flattening in the occipital region of the Blends, but the Iberians appear to be normal in this particular, although one is slightly flattened.

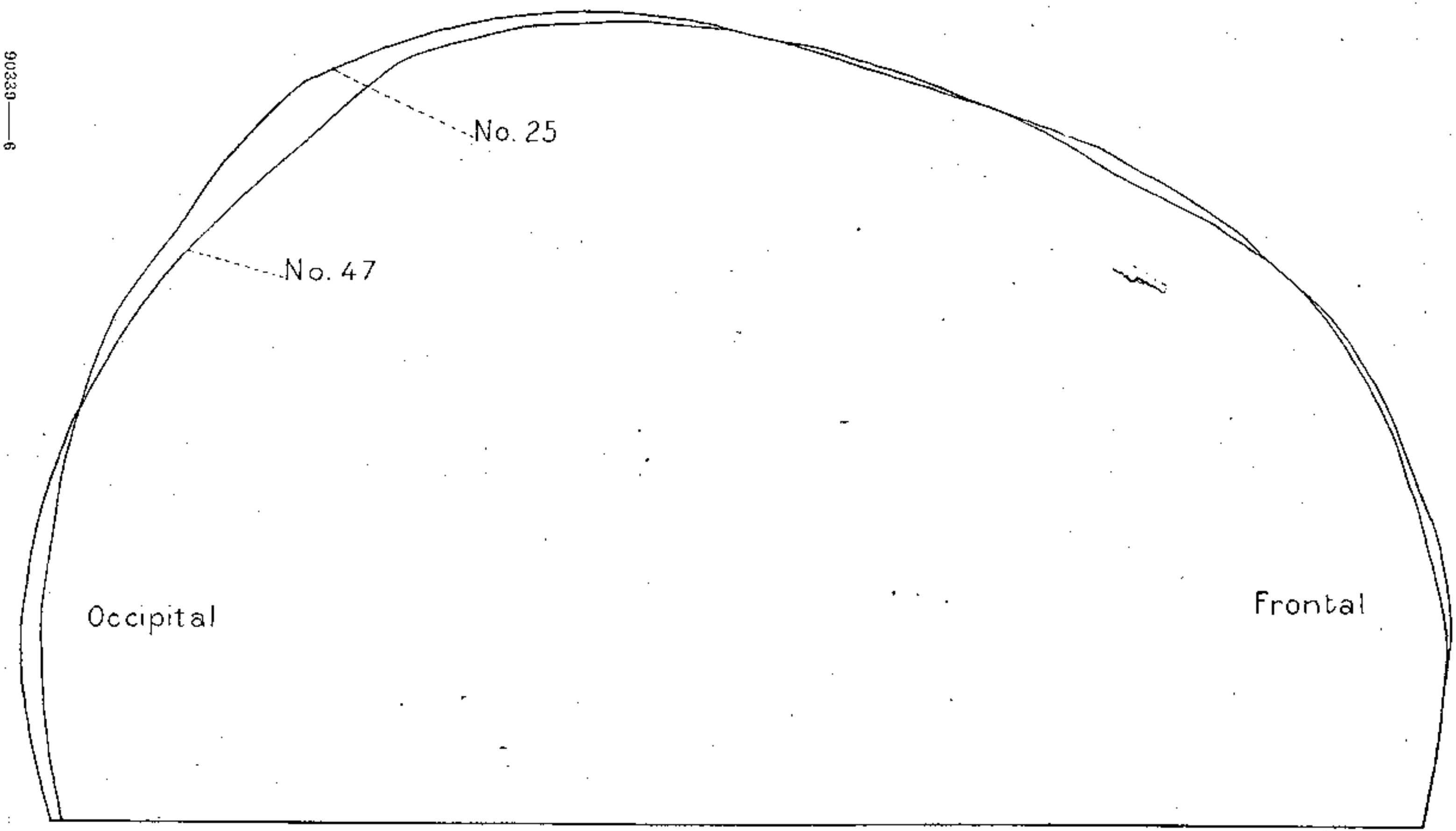

FIG. 14.—IBERIAN HEAD OUTLINES. SERIAL NOS. 25 AND 47.

The Cro-Magnon.

Character.	Maximum.	Mean.	Minimum.	Number of individuals.
Stature	170.7	167.7	165.3	12
Absolute lower leg length	42.2	39.7	37.3	11
Absolute upper leg length	47.1	42.5	39.5	11
Absolute forearm length	27.3	24.6	22.5	11
Absolute upper arm length	36.5	33.9	32.6	11
Omphalic index	51.6	42.9	38.6	11
Cephalic index	82.9	78.3	75.1	12
Nasal index	104.7	93.4	81.8	12
Morphologic face index	89.3	83.0	75.0	12

The stature of 12 men called Cro-Magnon is 167.7 centimeters, the cephalic index is 78.3, and the nasal index is 93.4. The omphalic index is 42, the morphologic face index is 83.0, the tibio-femoral index is 93.4, the radio-humeral index is 72.5, and the intermembral index is 71.2.

The stature is 8.2 centimeters greater than that of the average Taytayan, the cephalic index is 73.5 less, the nasal index is 8.2 greater, the omphalic index is practically the same, the morphologic face index is 1.7 greater, the radio-humeral index is 1.3 greater, the tibio-femoral index is 1.7 less and the intermembral index is 1.2 less. The lower leg is 2.4 centimeters longer, the upper leg is 3.3 centimeters longer, and the forearm and upper arm are each 1.5 centimeters longer.

The Cro-Magnon of Taytay is therefore an individual above the average in stature but not tall, with mesocephalic head and platyrrhine nose, although the nose is not flat but straight, long and wide. The face is large in both vertical and transverse directions. The limb parts are long, especially the forearm and upper leg, and the lower extremity is relatively longer than the upper. (Plate XV.) These factors indicate a relationship with the prehistoric Cro-Magnon of Europe.

For the sake of comparison, the measurements of the skeleton of the old man of the cavern of *less Eyzies*(9), from the sepulchre of the troglodytes of Périgord in the valley of the Vézere, in the region of Dordogne, France, described by Broca, and those of a skeleton of the cavern of *less Enfants*(35), from the sepulchre of the troglodytes of Grimaldi, on the Mediterranean, in Italy near Monaco, described by Verneau, will be presented, together with measurements of two individuals from Taytay. To make the comparison more interesting, with these are given the measurements of two Nilotic Negroes, of two Negroid skeletons of Grimaldi, of two blonde Americans now living in the Philippines, and of another Cro-Magnon skeleton from the grottoes of Grimaldi.

Comparison of Cro-Magnons, Negroes, Americans and Taytayans.

Body character.	Living.			Skeletons.						
	Taytayan serial No. 74, absolute.	Taytayan serial No. 103, absolute.	Average Taytayan, absolute.	Cro-Magnon (Broca les Ezzies, absolute.	Cro-Magnon (Verneau) Grotto des enfants, absolute.	Cro-Magnon (Vézère), absolute.	Grimaldi Negroes, absolute.	Grimaldi Negro boy, absolute.	Europeans (Broca), absolute.	Negroes (Broca), absolute.
Stature	167.7	167.0	159.5	-----	189.0	177.0	159.5	156.0	-----	-----
Upper leg length	46.6	40.6	39.2	-----	52.2	49.1	43.4	41.9	-----	-----
Lower leg length	38.1	40.6	37.3	-----	45.0	40.2	36.4	35.1	-----	-----
Upper arm length	34.1	32.6	32.4	-----	36.5	35.0	29.1	27.1	-----	-----
Forearm length	26.7	24.0	23.1	-----	27.9	-----	23.3	21.5	-----	-----
Head:										
Maximum length	19.3	19.4	18.3	20.2	19.8	20.6	19.1	10.2	-----	-----
Maximum breadth	14.7	14.7	15.0	14.9	15.1?	14.2?	13.1	13.3	-----	-----
Total face length	21.1	19.1	18.5	22.7?	24.5?	23.0?	16.0?	18.0?	-----	-----
Total face breadth	14.2	14.0	13.8	14.4	15.5?	15.2	10.3?	11.2?	-----	-----
Cephalic index	76.2	75.8	81.8	73.8	76.3	71.4	68.6	69.3	-----	-----
Face index	67.3	73.3	74.6	63.4	63.2	66.5	63.6	61.5	-----	-----
Preauricular circumference	28.2	27.7	27.5	27.2	26.9	-----	24.0	23.1	-----	-----
Post auricular circumference	29.6	29.0	28.5	29.6	29.1	-----	28.2	29.2	-----	-----
Nasal index	89.1	97.6	85.2	45.1	56.9	47.2	63.6	54.4	-----	-----
Tibio femoral index	81.8	100.0	95.2	-----	85.4	81.5	83.9	83.8	79.7	81.3
Radio-humeral index	78.3	73.6	71.3	-----	76.4	-----	80.1	79.4	73.9	79.4
Intermembral index	70.6	69.7	72.5	-----	66.1	-----	65.7	63.1	69.7	68.3

Body character.	Living.							
	A blonde American No. 1.		A Nilotic Negro (A Burum).		A Nilotic Negro (A Nuer).		A blonde American No. 2.	
	Absolute.	Relative.	Absolute.	Relative.	Absolute.	Relative.	Absolute.	Relative.
Stature	182.0	100.0	190.0	100.0	165.0	100.0	189.2	100.0
Upper leg length	47.0	25.8	51.0	26.8	46.0	27.8	51.5	27.2
Lower leg length	42.0	23.1	51.0	26.8	40.0	24.2	45.0?	23.8
Upper arm length	35.5	19.5	34.0	17.9	32.0	19.3	37.0	19.5
Forearm length	27.5	15.1	33.0	17.4	29.5	17.9	26.7	14.1
Head:								
Maximum length	20.0	-----	19.7	-----	20.0	-----	19.3	-----
Maximum breadth	15.0	-----	15.0	-----	14.0	-----	14.3	-----
Total face length	18.0	-----	18.9	-----	-----	-----	17.7	-----
Total face breadth	13.3	-----	14.0	-----	-----	-----	13.5	-----
Cephalic index	75.0	-----	76.1	-----	70.0	-----	74.1	-----
Face index	73.9	-----	74.1	-----	-----	-----	76.3	-----
Preauricular circumference	27.0	-----	-----	-----	-----	-----	-----	-----
Post auricular circumference	32.0	-----	-----	-----	-----	-----	-----	-----
Nasal index	66.0	-----	95.0	-----	95.0	-----	56.1	-----
Tibio femoral index	89.4	-----	100.0	-----	87.0	-----	87.3	-----
Radio humeral index	77.5	-----	97.1	-----	92.2	-----	72.2	-----
Intermembral index	70.8	-----	65.7	-----	71.5	-----	66.0	-----

It is to be noted that the stature of the Taytayan Cro-Magnons is only 167.0 and 169.7 centimeters. The calculated stature of the Cro-Magnon from Grimaldi is from 175 to 189 centimeters, of the Americans 182 and 189.2 centimeters, and of the Nilotic Negroes from 165 to 190, whereas the stature of the Grimaldi Negroes is only 156.0 to 159.5 centimeters. The last two measurements, however, are of an old woman and a boy.

The absolute upper leg length of the two Taytayans is 40.6 and 46.6 centimeters, the length of femur of the Cro-Magnon of Grimaldi is from 47 to 52.6 centimeters, the upper leg length of the Americans is 47 and 51.5 centimeters, the Nilotic Negroes are from 43 to 51 centimeters in upper leg length, and the Negroes of Grimaldi have a femur length of 41.9 and 43.4.

The absolute lower leg length of the Taytayan Cro-Magnon is 38.1 and 40.6 centimeters, the tibia length of the Cro-Magnon of Grimaldi is from 40.4 to 45.0 centimeters, the lower leg length of the Americans is 42 and 45 centimeters, that of the Nilotic Negroes is from 39 to 51 centimeters, and of the Negroes of Grimaldi 35.1 and 36.4 centimeters in length of tibia.

The absolute upper arm length of the Taytayans is 32.6 and 34.1 centimeters respectively, the length of the Cro-Magnon humerus is 34.2 to 37.9 centimeters, the upper arm of the American is 35.5 and 37.0 centimeters long, that of the Nilotic Negroes is 31 to 34 centimeters long, and the humerus of the Grimaldi Negroes is 27.1 and 29.1 centimeters in length.

The absolute forearm length of the Taytayans is 24 and 26.7 centimeters, the radius length of the Cro-Magnon is from 26.1 to 28.6 centimeters, the forearm of the Americans is 26.7 and 27.5 centimeters long, that of the Nilotic Negroes is from 29.5 to 33.0 centimeters in length, and the radius of the Grimaldi Negroes is 21.5 and 23.3 centimeters long.

Certain contrasts and parallels may be deduced from the foregoing: Whereas the stature of the Taytayan Cro-Magnon is less than that of any except the Grimaldi Negroes, yet the limb parts of the Taytayan are about as long as the Cro-Magnon of Europe or the Nilotic Negro, except the forearm of the latter which exceeds that of any other. The upper arm of the Taytayan is also relatively long, but in spite of these differences the evidence is such that the Taytayans selected are considered to be modified Cro-Magnons, and the Nilotic Negroes are also modified Cro-Magnons; the first with decreased stature and increased relative upper arm length due to the union with a type of that nature pertaining to the East, the other with about the same stature but with increased relative forearm length due to mixture with African types.

Verneau(34) has demonstrated the presence of Cro-Magnon types in the living population of Europe, and the measurements of the two Americans are given to show their relationship to the early Cro-Magnon of that country.

Head and face measurements corroborate the limb measurements and, if anything, are more emphatic in associating the Cro-Magnon with the Taytayan, and with the Nilotic Negro. The head length and breadth are greater in the Cro-Magnon than in the others, and the cephalic index is less, the face dimensions of the Cro-Magnon are also greater than in the others, but the head is dolichocephalic and the face is large in all alike. The nose of the Negro and of the Taytayan are more platyrrhine than the Cro-Magnon but in all it is similar: large and straight. The head, nose and face of the Americans are smaller than of the Cro-Magnon and indicate affinities to the Mediterranean Race of Sergi, or Iberian, as it is called in the present work.

Dr. Pirrie(38) noted that the occiput of the Nilotic Negro is prominent—projects boldly backwards—and this is characteristic of the Cro-Magnon. The Taytayan is not so marked in this feature but the occiput of one American exceeds all others in this respect. Figures 161 and 168, pages 368 and 370, in the Third Report of the Wellcome Research Laboratories, represent modified Cro-Magnon heads.

Undoubtedly, the Cro-Magnon has become dissipated by fusion in Europe and Africa, and I believe in Asia as well. Cro-Magnon characteristics may be noted among the Chinese of Manila(6), and among the Filipinos of many provinces. This may be accounted for through Spanish intermixture, but earlier infiltrations from Europe can not be excluded.

Cro-Magnon characteristics may be seen by examining Plates I, VIII, IX, X, XI, XII, and XV, although obscured by other types. Plate XV represents the nearest approach to the Cro-Magnon that could be photographed at Taytay, although partly Australoid and recent Iberian. The dorsal flattening of the head in the latter is, I believe, a relic of infancy when the head rested a great deal on the *petáte* with a hard flat surface beneath.

The sagittal head outlines from glabella to inion of the two Taytayan Cro-Magnons and of one American Cro-Magnon are given for comparison and contrasts. (Fig. 15.) The height of the two Taytayans is greater than the American, and, as a matter of fact, the auricular bregmatic height of the American is 12.4 centimeters whereas that of the Taytayans is 13 and 13.6 centimeters. The two Taytayan outlines were made with the cephalograph and are exact, but the outline of the American was made with electric fuse wire and is therefore not so exact, but it does not vary more than a few millimeters at any point and the general contour is a true representation of the head shape.

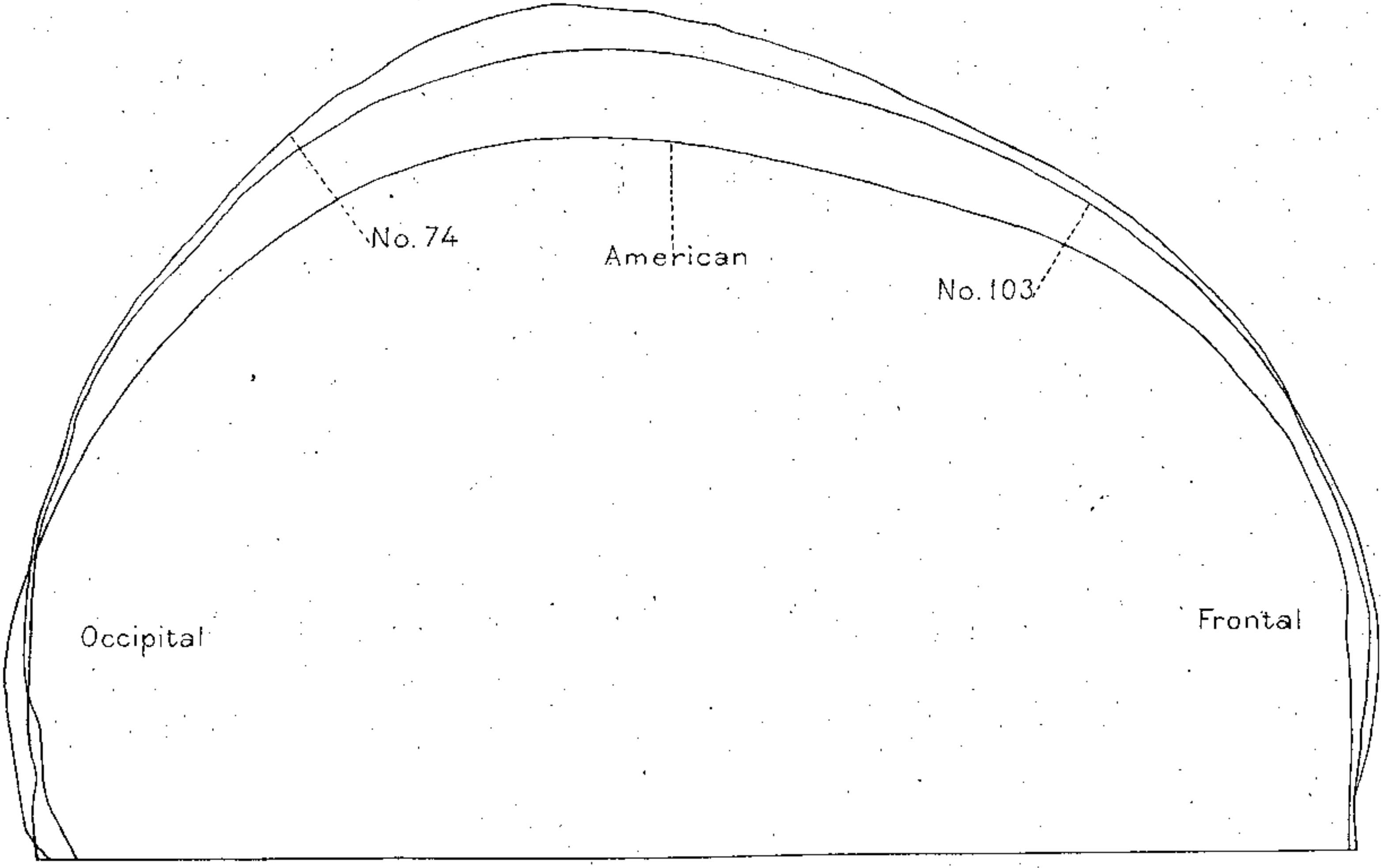

FIG. 15.—THREE CRO-MAGNON HEAD OUTLINES. BLONDE AMERICAN NO. 2. TAYTAYAN SERIAL NO. 74, CLINICAL NO. 535; SERIAL NO. 103, CLINICAL NO. 616. AMERICAN OUTLINE MADE WITH LEAD FUSE WIRE, THE OTHERS WITH THE CEPHALGRAPH.

The same difference between the American and Filipino outlines is seen as that noted between the American students and Igorots(3). The American is long and low, the Filipino is of equal length but high. Notwithstanding the differences, the three outlines resemble the outlines of the Cro-Magnon skulls of prehistoric Europe. This is especially true of the American outline which has the vertical forehead, the long straight superior part of the fronto-parietal region, and especially the projecting occiput, that makes it identical with the masculine cranium of the Grotto des Enfants portrayed in Plate III of Verneau's *"Grottes de Grimaldi."* The heads of the Taytayans have probably been somewhat flattened dorsally and thereby projected upward and pressed forward by the *petáte habit* of infancy; otherwise the shape may be due to crossing with the Primitive and other types.

Compare with these outlines the heads of two Nilotic Negroes(38) (figs. 161 and 168) and a striking similarity is seen, although the Negro heads show the flat superior frontal region previously described by me (Negro brain) which differentiates them from other peoples.

The Alpine.

Character.	Maximum.	Mean.	Minimum.	Number of individuals.
Stature	164.3	159.84	151.5	11
Absolute lower leg length	38.9	37.16	34.5	10
Absolute upper leg length	42.4	38.71	34.7	10
Absolute forearm length	25.2	22.54	18.3	12
Absolute upper arm length	34.8	32.72	29.0	10
Omphalic index	52.2	42.59	36.3	10
Cephalic index	94.3	87.74	84.3	11
Nasal index	81.1	70.08	54.9	11
Morphologic face index	89.7	82.21	75.5	11

The characteristics of the Alpine may be emphasized by contrast with the Cro-Magnon. The difference is great. The Alpine is small, the Cro-Magnon is almost tall; the Alpine is brachycephalic, the Cro-Magnon is dolichocephalic; the Alpine is leptorrhine, the Cro-Magnon is platyrrhine; the Alpine is short, squat and fat, the Cro-Magnon is long, lanky and lean; the lower leg of the Alpine is relatively long, that of the Cro-Magnon is not; the forearm of the Alpine is relatively shorter than that of the Cro-Magnon; and the face of the Cro-Magnon is relatively longer than that of the Alpine. The physiognomy and the ear are different as may be seen by an examination of the plates representing the Cro-Magnon characteristics, and of Plate XIII.

The Alpine is probably a mixture of Primitive and Iberian in which the head form of the Primitive is retained with the physiognomy and stature of the Iberian. The nose is even more leptorrhine than the Iberian and the morphologic face index is between that of the Primitive and Iberian but nearer the latter. Further observations on the ear are convincing and will be discussed further on in the present work.

The Alpine is therefore the complement of the Australoid which is supposed to represent the mixture of Primitive and Iberian in which the head form is Iberian and the physiognomy Primitive. This confirms in a measure the suggestion that human types conform to tomato hybrids suggested in a previous paper on Manila Students.

The B. B. B.

Character.	Maximum.	Mean.	Minimum.	Number of individuals.
Stature	166.8	**165.9**	165.0	2
Absolute lower leg length		**38.5**		1
Absolute upper leg length		**42.5**		1
Absolute forearm length		**23.8**		1
Absolute upper arm length		**29.8**		1
Omphalic index		**37.1**		1
Cephalic index	82.2	**81.7**	81.2	2
Nasal index	68.6	**67.6**	66.6	2
Morphologic face index	89.0	**87.4**	85.7	2

The evident characteristics of this species are stature slightly above the average, relatively short lower legs and short upper arms, low omphalic index, very narrow nose, and very long face with slightly brachycephalic head.

The species is fairly well illustrated in Plates XIV and XV, and in Plate I in the full figure on the right. It conforms in actual dimensions to the Students and Morgue subjects of the same species. The head outline is given in fig. 16 in contrast with the head outline of an Alpine.

As previously noted, this species is a large edition of the Alpine, but the two are different in many ways. It seems to be a combination of Alpine and Iberian. If the Alpine is a result of Iberian and Primitive blending, the two species, Alpine and B. B. B., are derived from the Primitive and Iberian by a process of crossing and re-crossing. Re-crossing the Primitive and Alpine should produce a species similar to the Alpine but more like the Primitive, and such a species is the Blend—at least that part of it that resembles the Primitive.

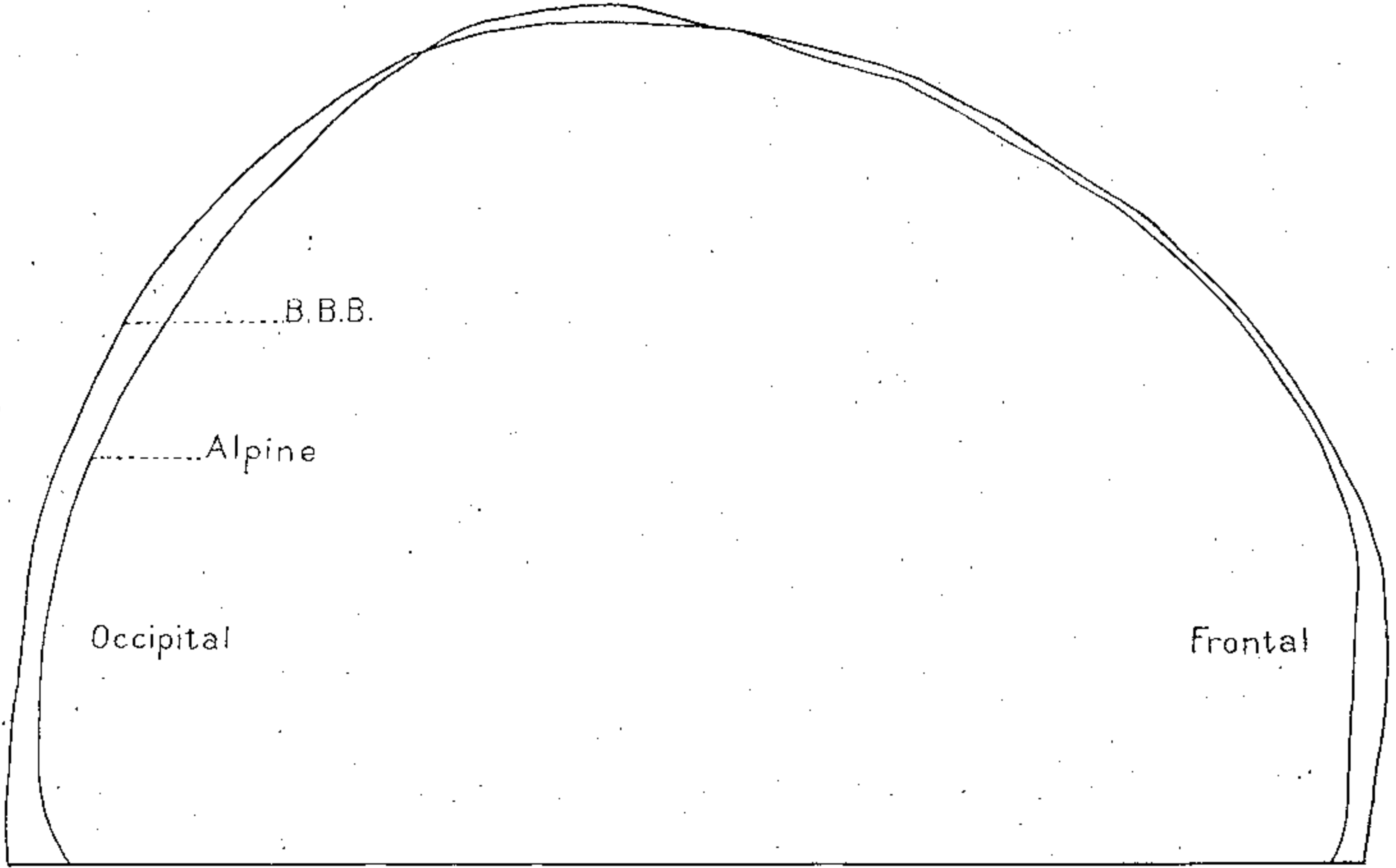

FIG. 16.—SAGITTAL HEAD OUTLINES OF ALPINE AND B. B. B. ALPINE IS SERIAL NO. 88, CLINICAL NO. 180. B. B. B. IS SERIAL NO. 8, CLINICAL NO. 353.

The Blend.

Character.	Maximum.	Mean.	Minimum.	Number of individuals.
Stature	171.0	158.8	145.7	94
Absolute lower leg length	41.0	37.2	32.4	87
Absolute upper leg length	43.9	39.1	33.2	88
Absolute forearm length	27.9	26.5	18.6	88
Absolute upper arm length	34.9	33.2	26.5	87
Omphalic index	57.6	42.2	20.4	88
Cephalic index	88.7	83.3	78.0	91
Nasal index	100.0	83.8	70.4	91
Morphologic face index	92.5	82.05	66.1	88

The Primitive, Modified Primitive and Adriatic enter largely into the Blend and one is tempted to constitute this as a definite species, embodying the Primitive and Adriatic. Two important differential characters that are Primitive in nature are noted: the high radio-humeral and tibio-femoral indices, the latter 95.1 and the former 79.8. The close relationship of the Taytayan Blend and the Primitive Morgue subject and Primitive Student in these particulars is noteworthy. The intermembral index is also high, being 78.2, as against 71.2 for the Cro-Magnon of Taytay. These three characters are Negroid or Negritic, and the inference is that the Negrito forms a large part of the composition of the Blend.

A review of the Blends reveals 55 of the 94 that resemble the Primitive. A similar review of the Igorots reveals 70 of the 104 that resemble the Australoid. The contrast needs no comment. Among the Blends there are also 10 that resemble the Iberian, 7 the Australoid, 5 the Modified Primitive, and 5 the Adriatic; the remainder are Alpine and B. B. B., and among these some Cro-Magnon that resemble the Iberian.

It is true that the majority among the Igorot Blends resemble the Primitive so that a similarity exists between the two peoples in this respect, but the differences between the groups are otherwise considerable.

The differences are slight when compared with the Blends of the Morgue subjects and the students. The stature of the student is greater, and the intermembral index of the morgue subject is less, but otherwise the Blends of all three form a somewhat stable composite that may be called a species. This species would be characterized by small stature, and would be brachycephalic, messorrhian, mesoprosopic, mesomphalic, with Negritic limb parts. All the characteristics are more Primitive than otherwise, the indications point to a dominating influence for the Primitive, and the Blend truly represents a Modified Primitive. The Adriatic and Modified Primitive will not be treated because of the small number of each and the Blend may be taken in their place as having absorbed them or modified them. However that may be, they are seldom seen in Taytay.

The head form of the Alpine, B. B. B., and Blend, as determined by the sagittal outlines, may be seen in figs. 10 and 16. The Alpine and B. B. B. are almost identical, except that the Alpine is shorter and higher as if it had been flattened more in the occipital region. The Blends appear to be exaggerated Alpine outlines exhibiting greater occipital flattening.

IV. EAR TYPE AND SPECIES.

In a previous monograph on Filipino Ears(6), an attempt was made to classify types of ears with concomitant morphologic types by general observations in a casual manner. The present work is an extension of the classification to a small number of individuals who are examined closely, in which more time is given, an exact study is made, and a more critical analysis of each individual's ears is possible. The result is a more exact classification of the ear types and the association of these with more definite types of men.

THE PRIMITIVE EAR.

This ear was previously named Malay, but there is now sufficient evidence of its association with the Primitive and allied forms to change the term Malay, which is an indefinite one at best, to that of Primitive, which represents not only the form of the individual but the characteristics of the ear as well. Both are infantile throughout. The description of the ear is altered somewhat from that of the Malay as follows:

The Primitive ear is small, round and somewhat flaring, cup shaped, and with depressed concha, in contrast with the everted concha of the Iberian. It is intermediate in form between that of a four month foetus as described by Schwalbe(27), and the adult European as exemplified by the Iberian. It is well illustrated in Plates I to V of the present work and in Plate IV of the monograph on Filipino ears(6). It may also be seen in Martin's work on the inland stem of the Malay Peninsula(18), as in the Senoi boy of fig. 31, page 317, the Senoi boy of fig. 47, page 359, the Senoi maiden of fig. 48, page 360, the Senoi of fig. 54, page 391, and probably in fig. 57, page 397, and fig. 96, page 708, (although there it is not so clear), in fig. 98, page 712, figs. 100 and 101, pages 717 and 719, and in Tables XII and XVI, in all of whom there are Primitive characteristics of physiognomy with Australoid heads. Other Senoi men and women illustrated in the same work do not have the Primitive ear and their physiognomy and other characters indicate other than Primitive features. Martin's Senoi and the Australoid herein described are of the same nature. Some forms partake of the Primitive except in head shape, whereas other forms are not Primitive, but Iberian or Negrito. The former are the *primary* Australoids, the latter the *secondary* Australoids.

(See pp. 414 and 439.) The Primitive ear appears pure or mixed at Taytay (see Table on p. 433) on 35 Blends, 15 Australoids, 3 Primitives, 3 Modified Primitives, 5 Cro-Magnons, 2 Alpines, 2 Iberians, and 1 Adriatic. The types partake of the Primitive in ear form to the extent represented by the number given with each. All the Primitive, Modified Primitive and Adriatic have Primitive ear forms, and the form occurs often in the Australoids and Blends. There is no Adriatic or Modified Primitive ear, but these themselves are altered Primitives. There is no Australoid form, but it may be of interest to note the forms of ears that appear upon the Australoid. As already stated, there are 15 that resemble the Primitive, in addition to which 26 resemble the Iberian, 7 the Alpine, 6 the odd type, 5 the B. B. B., and 32 are mixtures of either two or more of those already mentioned or of unknown type. The Australoid ear is largely Iberian and Primitive, thus corroborating the supposition of its origin as a result of the crossing of these two.

THE IBERIAN EAR.

The types of this ear have been increased to include the Cro-Magnon and the Igorot, in addition to which another type has been added, making five in all, to which may possibly be added the B. B. B. and Alpine, leaving all the ear forms thus far segregated either Iberian and Modified Iberian, or Primitive and Modified Primitive. The morphologic types become narrowed down to the European and the Eastern. But this is too simple, and the Alpine is more like the Primitive than like the Iberian, and the B. B. B. is distinct from either. The Igorot ear has resolved into the Iberian (C), a modified B. B. B., and the Subnorthern (Chinese), all three of which have similarities, but each of which is different from the other. The Igorot ears will be presented in a subsequent publication. Good photographs were secured of all the Iberian types except C.

THE IBERIAN A EAR.

This ear is represented somewhat modified in Plate II and it may also be seen in Plate VIII of the Filipino ears (6), and in the Plates I, V, VI, and VII of the Theory of Heredity (2) in an Iberian from Madrid, Spain. It is a round or elliptical ear, usually flaring slightly and often standing out from the head. The helix and lobule are symmetrical, and the helix is inrolled until it almost touches the everted concha.

This ear, or modifications of it, occurs on 25 Blends, 9 Iberians, 6 Australoids, 3 Cro-Magnons and 2 Alpines. It is found more often among the Blends than is any other except the Primitive, and it is in greater proportion among the Iberians than is any other ear form.

THE IBERIAN B EAR.

The Iberian B is the most distinct of all the Iberian ears, and probably represents the true type. When it appears on an individual it is clear cut, as a rule, indicating a lack of blending, or it may be that the other Iberian ears are blends, whereas this is the original type. The ear is well illustrated in Plate VIII of the present work and in Plate IX of the Filipino Ears(6). The description given in that paper can hardly be more exact. The eversion of the concha, the direct attachment of the lobule to the cheeks with the absence of the lobule, and the peculiar spiral twist as seen from any point are unmistakable and emphasize the ear as a most distinct type.

It is found pure or impure on 12 Blends, 7 Australoids, 2 Iberians and 1 Alpine. Its numbers are relatively small compared with the other Iberians. The 4 individuals in which the ear is comparatively pure are all Blends with small stature; they are mesorrhinean and brachycephalic, but three of them have the flat occiput that is probably due to distortion; therefore the heads would probably have been dolichocephalic with the absence of the dorsal flattening, the Blends thus becoming Iberians.

The ear is frequently associated with the Iberian C ear which is apparently a modified form of the Iberian B.

THE IBERIAN C EAR (IGOROT).

This ear resembles the Igorot ear because it has a square inferior margin without lobule, but it is smaller, more slender, and the lower margin is narrow, whereas that of the Igorots is broad. Undoubtedly this form of ear is present among the Igorots and could readily be mistaken for the Igorot ear, but the above-mentioned qualities differentiate it. The Iberian C also resembles a form of Chinese ear, except that the latter stands almost at right angles to the head, whereas this form does not. The Iberian C ear is small, slender and delicately molded, and either stands close to the head or flares very little. The lobule is absent, and in its place the lower part of the ear is square, joining the cheek at right angles. It occurs more or less pure on 22 Blends, 7 Australoids, 6 Cro-Magnons, 5 Iberians, 4 Alpines and 1 Primitive: 45 times in all.

The relatively pure Iberian C ear appears on 5 Cro-Magnons, 4 Blends, and 1 Alpine. Two of these individuals are small, 2 are below medium height, 4 are above medium height, and 2 are tall. Three heads are decidedly flat behind, which, were the flattening absent, would remove the individuals from the group of Blends to the Iberian. The middle figure in Plate III and in Plate VI of the monograph on the Igorots(3) shows Iberian C ears.

THE IBERIAN D EAR (CRO-MAGNON).

This ear is so well illustrated in Plates IX and X that it needs no description. It is the long ear previously portrayed and described as the Cro-Magnon(6). Its leading characteristics are the large pendant lobule, large open concha somewhat everted, and straight external margin of the helix.

The ear appears pure or mixed on 20 Blends, 7 Iberians, 6 Australoids, 4 Alpine, 3 Cro-Magnons and 1 B. B. B. None of the individuals with relatively pure type ears are tall, and only two are above medium height, but 4 are below medium height and 7 are small. This is therefore not a Cro-Magnon physique, but an Iberian. The individuals with Iberian C ears resemble the Cro-Magnon in size more than those with Iberian D ears. The Cro-Magnon ear has become disseminated apparently among the Iberian types to such an extent as to lose its identity; and for this reason it can not be located and described. However, at rare intervals an ear appears that is similar to that shown in figure 12 of the monograph on Filipino Ears(6), and also to that in No. 3202 in Plate VII and No. 14964 in Plate X of the same paper, in which the ear is long and resembles the Iberian D; but its position is almost at right angles to the head, the lobule is not pendant, and the helix is much inrolled with everted concha. This was named the Cro-Magnon, but, as may be recognized, the characters are largely Iberian, and most frequently appear in association with one or another Iberian type.

THE IBERIAN E EAR.

This type is rare, and a doubtful entity, although a similar ear form has been seen on at least 3 men in Manila recently: one a German, one an Englishman, and one a Filipino. The ear stands straight from the upper part of the base, and the helix tends to roll over above, giving a drooping appearance. Otherwise, the ear is similar to the Iberian A in form. The individuals have very long heads, small stature, and their physiognomy is characteristic. The nose is aquiline, the lips are full, the eyes are large and wide open. One hesitates to assign this ear to the Iberian or to designate it as a specific form, and future investigations may clear up its relationships. For the present it remains Iberian E, and may be seen in modified form in Plate XII.

THE ALPINE EAR.

This ear, unfortunately, does not appear on a single individual of the Alpine species, and occurs only twice in relative purity, the two individuals being Australoids. The ear is found on 9 Blends, 7 Australoids, and 1 each Cro-Magnon, Iberian, Primitive, and Modified Primitive. The ear in absolute purity was not seen once in Taytay, but was present only in modified form resembling the Primitive, as may be seen in Plate XIII. This confirms previous observations. However, as the study of this ear continues, it looks more and more like a blend of Iberian and Primitive. The front view can with difficulty be differentiated from the Primitive. The lateral view shows the concha somewhat everted and the absence of lobule, suggesting the Iberian B. The Alpine ear and the Alpine species will be found purer and more often in conjunction wherever the Philippine population is not so mixed as it is at Taytay.

THE B. B. B. EAR.

This ear, like the Alpine, was not found in purity at Taytay. Modified forms may be seen, however, in Plates XIV and XV, where it resembles the pure type, but it is by no means pure. Oblong shape and almost flat surface characterize the ear when pure. These characters are present in the two individuals portrayed, but only in a modified way.

The ear appears more or less pure on 11 Blends, 5 Australoids, 2 Iberians, 1 B. B. B., 1 Cro-Magnon, and 1 Alpine.

THE COMPARISON OF EAR TYPE AND MORPHOLOGIC TYPE.

The table is presented showing the number of each kind of ears found on the individuals of the different species.

Comparison of ear and morphologic types.

Morphologic types.	Ear types.												
	Primitive.	Iberian total.	A.	B.	C.	D.	B. B. B.	Alpine.	Odd type.	Pure ear forms.	Mixed ear forms.	Total ear forms.	Total number of individuals.
Blend	35	79	25	12	22	20	11	9	17	20	74	161	94
Australoid	15	26	6	7	7	6	5	7	6	5	32	59	37
Iberian	2	23	9	2	5	7	2	1	4	5	12	32	17
Cro-Magnon	5	12	3	0	6	3	1	1	1	5	7	20	12
Alpine	2	11	2	1	4	4	1	0	1	5	7	15	12
B. B. B	0	1	0	0	0	1	1	0	1	1	1	3	2
Primitive	3	1	0	0	1	0	0	1	0	0	3	5	3
Modified Primitive	3	0	0	0	0	0	0	1	2	1	3	6	4
Adriatic	1	0	0	0	0	0	0	0	0	0	1	2	1
Total	66	153	45	22	45	41	21	20	32	42	140	302	182

The last four columns of the table need some explanation. The pure ear forms are those in which the ears resemble only one type, and the mixed ear forms are those in which more than one type is combined. The two columns (pure and mixed ear forms) equal the total number of individuals. The total ear forms are obtained by adding the number of Primitive, Iberian, B. B. B., Alpine and odd Type ears.

The Blend has more than twice as many Iberian as Primitive forms, and a relatively large number of the odd type. The mixed ear forms and the total ear forms are in relatively greater abundance than among the pure types.

The Australoid has less than twice as many Iberian as Primitive ear forms, and a relatively large number of Alpine ears. The number of pure ear forms is small and the number of mixed ear forms is almost as great as the total number of individuals. The Australoid and the Blend are evidently impure types.

The Iberian species has only two ears that resemble the Primitive form and 23 that are Iberian, whereas the Primitive species has only one resembling the Iberian, and 3 that are Primitive in form. The Iberian has a relatively large number of pure ear forms, and few mixed ear forms. The Primitive and Iberian species are evidently purer than the Australoid and Blend in ear form. Each Cro-Magnon individual has some Iberian ear form, although 5 resemble the Primitive. The pure ear forms are relatively great and the mixed are relatively small.

The Alpine species also has a large number of Iberian ear forms and only two that resemble the Primitive. The pure forms are also relatively more frequent than the mixed.

The Modified Primitive has Primitive ears, and the Adriatic has the same form.

The B. B. B. species has B. B. B. and Iberian ears.

There are seven ear forms that are called mixed because no resemblance to any recognized form could be seen.

SUMMARY.

The ear form is established beyond doubt as a differential factor in racial anatomy, and among the Filipinos of the littoral it should be placed above the cephalic index in importance, because of the apparent distortion of the head in many individuals. By the ear alone, the derivation of the majority of people may be determined, and in conjunction with the nasal index and stature, assisted by the cephalic index, more definite species can be segregated than by using the last three without the ear type. The table of ear types and morphologic species demonstrates that the species segregated by means of the three morphologic factors are not entirely homogeneous in ear form, and this lack of homogeneity is probably due to the distorted heads. The Iberian species as segregated is relatively pure, although this is the Filipino-Iberian, a mixed species in reality. The Cro-Magnon is partly Iberian and partly Primitive, but the Cro-Magnon characters have been positively proved. The Australoid is segregated as a mixed species in process of formation and the ear form substantiates this. The three species are dolichocephalic, and although their heads might be longer if no dorsal flattening appeared in any individual, yet the flattening is a negligible factor. Not so, however, with the remaining species, except the Primitive, Modified Primitive and Adriatic, whose heads are so hyper-brachycephalic that if there were no dorsal flattening the heads would probably still be brachycephalic. The Blend, the Alpine and the B. B. B. are not so hyper-brachycephalic, and if the heads that are flattened dorsally could be made natural, some of the individuals of these types would be Iberians. This is indicated by the relatively large number that have Iberian ears.

Therefore I would alter the terminology of the species of some individuals where the ear type is significant. This is done in the table of indices in the first column (Table II, pp. 390–397) by placing in parenthesis the alteration. The species, as selected by the three factors, cephalic index, nasal index, and stature, is placed first in this column, after which in parenthesis, come the true species as determined by a consideration of the ear form and other characteristics.

The number of individuals in each species becomes altered as shown in the following table:

	Iberian.	Blend.	Australoid.	Alpine.	Cro-Magnon.	B.B.B.	Primitive.	Modified Primitive.	Adriatic.
Original classification	17	94	37	12	12	2	3	4	1
Altered classification	50	41	39	11	13	4	14	9	1

In the original classification, the number of individuals constituting the Blend exceeds that of all the species combined, which was obviously too great a number in so mixed a population. The altered classification reduces the Blends more than one-half by placing a large number of them with the Iberian, Primitive and Modified Primitive. The other species remain practically unaltered except the B. B. B., which is increased by two individuals, thus doubling the former number. This is a more exact classification and represents real conditions.

The Taytayans would therefore be placed in the scheme for heredity(2) between 2 and 3 under Spurious Mendelism, and they would be nearer 2 than 3 because the number of species greatly exceeds the number of Blends, and at least two species, the Iberian and the Primitive, are relatively pure.

In concluding the discussion of the ear form, it may not be out of place to criticize the types selected by Folkmar and presented in his Album of Philippine Types(11). The majority of them are Blends with evident Iberian characteristics, but many of them are sufficiently pure in type to be classified as species exactly by their ear form.

Plate 56 of Folkmar, represents a typical Primitive with a typical Primitive ear. This is a Visayan with a stature of 148.5 centimeters, a cephalic index of 92.17 and a nasal index of 91.49. The head has the flat occipital region said to be characteristic of the Malay, and this probably accounts for the high cephalic index. The ear presents the double roll aspect so often seen in the Primitive, caused by the helix and concha lying close together.

The Negrito-Tagalog, in Plate 76 of Folkmar, has Modified Primitive ears but would be classed as Australoid by other characteristics. Likewise the Negrito of Plate 78 of Folkmar, has Modified Primitive ears but is Australoid by the cephalic index of 78.45, nasal index of 102.38 and stature of 135.7 centimeters. Other Modified Primitive ears may be seen in Plates 14, 34, 66, and 67 of Folkmar.

The Alpine ear may be seen in Plate 44 of Folkmar, where the individual (a Tagalog of Laguna Province) is also of that species, with a stature of 163.5 centimeters and cephalic index and nasal index of 88.24 and 83.67 respectively. Other Alpine ears somewhat modified and resembling both Primitive and Iberian, may be seen in Plates 1, 17, 20, 21, 25, 37, and 66 of Folkmar.

Plate 60 of Folkmar, a Visayan of Masbate, represents a secondary or recent Australoid, with typical Iberian A ears.

Plate 41 of Folkmar, a Tagalog of Bulacan Province, has Iberian C ears, and the physiognomy is mixed Iberian, the individual being a Blend.

Other more or less pure Iberian ears may be seen in Plates 4, 5, 8, 12, 15, of Folkmar, many others throughout the Album have some Iberian characteristics, and only a few have no Iberian characters in ear form.

Plate 59 and plates 50 and 75 of Folkmar represent modified B. B. B. ears, and types with oblong face and head resembling the B. B. B. species.

A man simulating the Cro-Magnon and having Iberian (Cro-Magnon?) ears is seen in Plate 32 of Folkmar.

Folkmar may have classified Filipinos to his own satisfaction, and others may see the Tagalog, or Ilokano or Visayan type, but I can not find sufficient uniformity of characteristics to justify the classification into such groups although there may be a slight superficial resemblance in facial expression, attitude, manner of action, etc. Folkmar's divisions are therefore unjustified, whereas by the ear type and its associated physical type, much may be obtained from the plates of his Album.

There can be no doubt of the two species, Primitive and Iberian, among the Filipinos, and it is possible that the various manifestations of these and the union of their different characters in many combinations result in the other species, although the B. B. B. when pure is unlike either the Primitive or Iberian.

V. DISEASE AND SPECIES.

The association of tuberculosis and beriberi with the Iberian and Primitive species respectively, was previously determined in a study of the types found in Malecon Morgue(5). The present study corroborates the association of the Iberian species with tuberculosis, but adds nothing to substantiate the association of beriberi with the Primitive species, because only one case of beriberi is noted and that in a Cro-Magnon, although the ears of this individual showed Primitive markings.

The afflictions of the Iberian were 9 with intestinal parasites, 4 with tuberculosis of the lungs and 1 with other lung or pleural affections, 1 with heart or arterial disease, 2 with fever and 1 with neurasthenia. Such few observations would mean little, but they corroborate previous findings in the morgue, therefore their meaning is significant.

The Primitive, 3 subjects, have 2 with animal parasites, 1 with lung or pleural affections and 1 with some acute infection.

The Australoid is affected in 18 cases with animal parasites, 6 with tuberculosis, 2 with other lung or pleural affections, 2 with heart or arterial disease, 1 with neurasthenia, and 3 with the kidneys or genito-urinary organs affected. The large number of cases of tuberculosis is probably due to Iberian influence.

Among the Blends are 60 cases of animal parasites, 12 cases of tuberculosis, 8 cases of lung or pleural affections other than tuberculosis, 18 alimentary affections other than animal parasites, 5 heart and arterial diseases, 4 cases of fever, 5 of acute infections, 3 with skin diseases including 1 case of leprosy, 3 with diseases of the kidneys and genito-urinary organs, 1 case of rheumatism, and 1 of splenic affection.

The diseases group themselves in a similar manner when the ear type alone is the differential factor, as in the following table:

	Intestinal parasites.	Respiratory.	Circulatory.	Nervous.	Fevers.	Urinary.	Alimentary.	Others.
Mixed ears	49	17	4	1	1	6	8	4
Iberian ears	26	13	3	1	2	0	5	3
Iberian-Primitive ears	11	2	1	10	3	1	1	1

The mixed ears include those that are not of any distinct type and whose affinites are obscure or of many kinds. Probably the majority of these have Iberian characteristics.

The Iberian has a greater proportion of lung affections and fewer urinary troubles than the mixed. The Iberian-Primitive has fewer lung troubles and a greater number of intestinal parasites than either the Iberian or mixed.

Other forms are not considered because there are too few for comparative purposes.

The Iberian and the Primitive are next compared by taking every individual in which either type of ear occurs, be it pure or not, there being 59 in the Iberian group and 29 in the Primitive. The diseases are then found to be as follows:

	Number.	Intestinal parasites.	Lung.	Tuberculosis.	Alimentary.	Circulatory.	Malaria.	Others.	Beri-beri.	Total.
Iberian	59	48	18	12	10	8	4	7	0	107
Primitive	29	19	3	1	2	1	0	3	1	29

This again corroborates previous findings, and signifies that by the ear alone the susceptibility to tuberculosis may be indicated. There are also indications that malaria is more frequent among the Iberian Filipinos, and that the heart and arteries are affected more often than in the Primitive. Indeed, all diseases are associated more frequently with the Iberian than the Primitive, except beriberi, and only one case of this disease is reported among the men measured.

No absolute conclusions would be justified from the facts exposed, but the inference is strong that the Iberian is more susceptible to all diseases but more especially to tuberculosis than the Primitive. This may be indicative that the European and Filipino blend, or its resulting off-spring of the Iberian type, is less resistant to disease in the tropics than is the aboriginal type on its own soil and in its natural environment.

The records of disease may be found in the statistics of the Medical Survey of the town of Taytay in the Biological Laboratory, Bureau of Science, from which the data are drawn.

CONCLUSIONS.—THE SEPARATION OF THE TYPES INTO SYSTEMATIC AND ELEMENTARY SPECIES.

The time has come when the types of men found in the Philippine Islands may be designated without doubt as elementary and systematic species. It is entirely without the province of anthropology to define these terms so that they will apply to all zoölogical forms, but the studies of the past few years among the Negroes, the students, and the school children in America, among the Igorots, the Manila students from all parts of the Philippine Islands, the morgue subjects and the people of Taytay, as well as a study of Filipino ears, justifies a classification of the types of man into two definite groups. One contains the types that are stable and have been stable for many hundreds if not thousands of years, and that do not blend readily when crossed with other stable types; these are called systematic species. The other group contains the types that are unstable, that have not been in existence so great a time, and that blend readily, especially with nearly related types; these are called elementary species.

Each species may have subspecies or varieties. The elementary species are cross sections of variable species which have been formed by the union of two diverse species, whereas subspecies or varieties are cross sections of systematic species that are variable through inherent changes not due to actual crossing but to the interplay of heredity and environment. Elementary species and subspecies or varieties may sometimes be the same, and ultimately may prove to be synonymous terms. Varieties may become systematic species when they shall be sufficiently differentiated, and shall have become stable. Elementary species may become systematic species when the blending elements have reached a stage of slight variability and have become a pure blend. The difference between elementary species and variety is that the first is the beginning formation of a systematic species by the blending of two others, whereas the second is the beginning formation of a systematic species by the differentiation and disintegration of an old systematic species.

The proper use of the terms, systematic species, elementary species and variety, may be illustrated by the Filipino types of this and previous studies.

The Iberian type became isolated many hundreds of years ago and became a systematic species of man, and, in the course of time, developed varieties which Sergi (28), under the title of the Mediterranean Race, has differentiated and designated by their skull form. The varieties of this type spread over the face of the earth, and as they came to the Orient they encountered an entirely different type, another systematic species, the Primitive with its varieties. The commingling of the varied forms resulted in several new types which are elementary species or variable blends of the varieties of the two original systematic species. This will probably account for every people of the East except the Negrito, and it may prove useful in unravelling their varied forms, because the Negritos are not homogeneous, as will be evident from forthcoming studies.

The present and previous studies reveal at least four types of Iberian ears, which differentiate the Iberian varieties, and to this extent the division of the Mediterranean Race by Sergi is corroborated. The Primitive may also be subdivided into at least three types; the Primitive proper, the Modified Primitive, and the Adriatic, and also the Blends, all of which have ears of similar form that have not yet been differentiated, but the three varieties of men are none the less evident.

The union of the Iberian and Primitive species as constituted by their varieties, has produced in the Philippines the Australoid, Alpine, and B. B. B., if not the Cro-Magnon. Their union to form the Australoid had resulted in the type A of the Igorots,—the *primary* Australoid—at the time the Spaniard's came to the Islands, after which a new infusion of modified Iberians caused an alteration of the *primary* Australoid and the formation of the *secondary* Australoid. The *primary* Australoid is an elementary species, and the *secondary* Australoid is also an elementary species but different from the *primary*.

The Alpine represents the union of the Iberian and Primitive as a complementary form to the Australoid but without subdivision, although the B. B. B. probably stands in the same relation to the Alpine as the secondary Australoid to the primary.

The Cro-Magnon has Iberian qualities and also Primitive, but not so definite as the Iberian. This form is probably the result of recent and remote Cro-Magnon elements which came with the Iberian from Europe. Its relation to the Australoid is similar to the relationship of the B. B. B. to the Alpine.

The question of race naturally suggests itself here and may be considered in relation to the varied forms that constitute the Filipino people.

The definitions of *species, variety* and *race* are given by Quatrefages(21) as clearly as one may hope to have them:

> "*Species* is a collection of individuals more or less resembling each other, which may be regarded as having descended from a single primitive pair by an uninterrupted and natural succession of families."
>
> *Variety* is "An individual or a number of individuals belonging to the same sexual generation, which is distinguished from the other representatives of the same species by one or several exceptional characters."
>
> *Race* is "A number of individuals resembling each other, belonging to one species, having received and trasmitting, by means of sexual generation, the characters of a primitive variety."

There is nothing in the above definitions that is incompatible with the ideas formulated and expressed in the preceding pages as to systematic species and varieties, but Quatrefages gives no definition of a type that is formed by the union of two other types, therefore room is left for the term elementary species as defined above.

The use of the word *race* may well apply as indicated by Quatrefages, except that such an entity becomes again a *species* as soon as it is established as a *race.* Derivatives of the primary races are termed secondary races, and derivatives of these tertiary races by Quatrefages, but when many of these become fused the term race is used no longer. Would it not be better to continue the terms *species* and *variety,* or to give the name *type* to the primary, secondary, tertiary, etc., *races* of Quatrefages, and to dignify each nationality that has developed characteristics that differentiate it from other nationalities by the term *race,* as the German race, the French race, the Filipino race? Otherwise, the word race becomes lost or relegated to designate remnants of humanity such as the Esquimo and the Negrito, which are only types or varieties.

The term *race* should apply to any composite body of individuals who are becoming or may have become a distinct type by a natural or an artificial process. A race may contain systematic species, varieties and elementary species in profusion. A Filipino race at present exists under this terminology but not under that of Quatrefages, nor would more than a few of the world's living peoples be races according to his definition. Race would apply also to the Cro-Magnon of early Europe, the Mediterranean of Sergi and to other forms that have become dispersed and diffused or remain as fragments such as the Basque, the Esquimo and the Negrito. There would be a German race and an English race, a Dutch race and a Spanish race, but not a white race or a black race or a yellow race, because elements of each color are fusing in different ways in various places, and the color markings do not constitute a definite factor of differentiation, although color may be useful as an adjunct. Color markings have been of no value in the differentiation of Filipino types. Hair form has been of little avail in the study of the Filipinos, because they all have straight black hair, with an occasional wave. The cephalic index has been found unreliable because of possible distortion of the head. In the place of this, however, the ear form has been found a better indicator, and by this alone much can be known as to the individuals' component elements. In conjunction with the other physical factors, nasal index, facial index, stature, brachial and crural indices, etc., the ear form is of great service.

By means of these factors the men of Taytay have been separated into groups that are called species and varieties in the following classification:

Systematic species.	Varieties.	Elementary species.
Iberian	Iberian A	
	Iberian B	
	Iberian C (Igorot)	
	Iberian D (Cro-Magnon)	
Australoid (?)	Primary Australoid	Cro-Magnon (?) B. B. B. (?)
	Secondary Australoid (Negrito)?	Australoid. Alpine.
Primitive	Primitive	
	Modified Primitive	
	Blend (?)	
	Adriatic	

Two processes are supposed to have been active, a differentiation of the Iberian and Primitive into diverse forms, producing varieties, and a fusion of the varieties to make the elementary species. It can not be absolutely determined that the Primitive and Iberian did not arise by the fusion of other forms, but if so, they had so completely fused as to be true systematic species, unless the varieties represent the forms that previously fused. The Australoid furnishes an interesting example of the fusion of two forms, and at the same time the production of two different forms, although the *secondary* Australoid may represent Negrito elements.

There seems to be in man a life cycle of the following nature: The crossing of diverse types induces a condition of Mendelism more or less pure, depending upon the amount of resemblance between the types, following which comes spurious Mendelism when the types begin to blend and later no Mendelism but a tendency to blend and a tendency to remain true to type until a perfect blend is formed. This is the first cycle, and the perfect blend becomes a systematic species when sufficiently stable. After this, the systematic species becomes diversified through inherent variation acted upon by the environment, until differentiation results in the formation of varieties with any one of which or all together the cycle may be repeated.

There is first a period of alternate inheritance, then a period of blending followed by a period of stability, after which differentiation begins. The four periods are not clear-cut but overlap, and more than one may be going on at the same time.

Fusion of the mass of Filipinos throughout is evident in the formation of a blend that will probably be largely Primitive, or between that and the Adriatic, because in the course of time the Iberian elements will be eliminated to a great extent by disease, especially tuberculosis.

The Filipinos of Taytay are therefore in the blending period, but at the same time some of the types may exhibit alternate heredity, some are in a condition of stability, and others are undergoing differentiation. There is, no doubt, an exemplification of Galton and Pearson's ancestral heredity and reversion to mediocrity, yet fusion of all the elements seems to be the ultimate goal.

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ILLUSTRATIONS.[1]

PLATE I. The men of Taytay. The first figure from the left is an Iberian D with Cro-Magnon affinities. The second figure from the left is an Australoid of the *secondary* variety with Iberian affinities. The middle figure is the only Iberian E seen at Taytay. The figure to the right of the center is a Modified B. B. B. with Cro-Magnon affinities. The figure on the right is the only B. B. B. seen at Taytay that approached nearly the pure type.

II. A Bagobo woman from Davao, Mindanao. Primitive ears and Primitive species.

III. An Ifugao woman from Quiangan, Nueva Viscaya Province, Luzon. Primitive ears and Primitive species.

IV. A Bontoc Igorot woman from the Mountain Province of Luzon. Primitive ears and Modified Primitive species.

V. A Bukidnon man from Capiz, Iloilo. Primitive ears and Primitive species.

VI. A Kalinga from Ilagan, Isabela Province Luzon. Mixed Primitive ears and mixed Primitive species.

VII. An East Indian type from Cainta. Modified Iberian A ears, and modified Iberian A subspecies or variety.

VIII. An East Indian type from Cainta. Modified Iberian B ears, and modified Iberian B subspecies or variety. Cro-Magnon affinities.

IX. An East Indian type from Cainta. Modified Iberian D ears, and modified Iberian D subspecies or variety. Cro-Magnon affinities.

X. An old man from near Taytay. Modified Iberian D ears and modified Iberian D subspecies or variety. Cro-Magnon affinities.

XI. An official of Taytay. Modified Iberian B and D ears and subspecies or variety. Cro-Magnon affinities.

XII. A carpenter of Taytay. Modified Iberian E. Cro-Magnon affinities.

XIII. A hammock carrier of Taytay. Mixed Alpine and Primitive ears and species.

XIV. A property owner of Taytay. Modified B. B. B. ears and species. The subject is afflicted with yaws.

XV. A retired proprietor of Taytay. Modified B. B. B. ears and species. Cro-Magnon affinities. Partial facial paralysis.

XVI. A laborer of Taytay. *Secondary* Australoid variety. Iberian affinities.

XVII. A fisherman of Taytay. *Secondary* Australoid variety. Iberian affinities.

XVIII. Two Philippine skulls that show right dorsal flattening and consequent left ventral bulging. Well marked in the skull on the left.

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[1] All photographs used in this study were made by Mr. Martin of the Bureau of Science or his assistants.

TEXT FIGURES.[2]

FIG. 1. Curve of stature of 183 adult male Taytayans. The number of individuals with a given stature is placed over each point on the line.

2. Stature and age.
3. Average Taytayan head outline. Serial number 99, clinical number 176.
4. The solid lines on the left represent the average European according to the canon of Fritsch. The broken lines on the right represent the average Taytayan according to the same canon. The European stature is equal to 8 total head heights. The Taytayan stature is equal to 7 total head heights. A and B point to the chin.
5. Composite head outlines of 74 brachycephalic individuals.
6. Composite head outlines of 69 mesocephalic individuals.
7. Composite head outlines of 22 dolichocephalic individuals.
8. Boy of Taytay aged 4. The small outline is from the left side of the head over the middle of the eye. The large outline is from the right side of the head a little nearer the median line.
9. Boy of Taytay aged 10. The short outline is 3 centimeters to the left of the midline. The long outline circumscribes the sagittal plane.
10. Head outlines of two Primitive Blends with flattened occipital region. Serial numbers 137 and 158.
11. Head outline illustrating the bony band about the occiput.
12. Primitive and Iberian head outlines. Iberian serial number 33, Primitive serial number 110.
13. Australoid head outline. Serial number 89, clinical number 564.
14. Iberian head outlines. Serial numbers 25 and 47.
15. Three Cro-Magnon head outlines. Blonde American number 2; Taytayan serial number 74; clinical number 535; serial number 103, clinical number 616.
16. Sagittal head outlines of Alpine and B. B. B. Alpine is serial number 88, clinical number 180; B. B. B. is serial number 8, clinical number 353.

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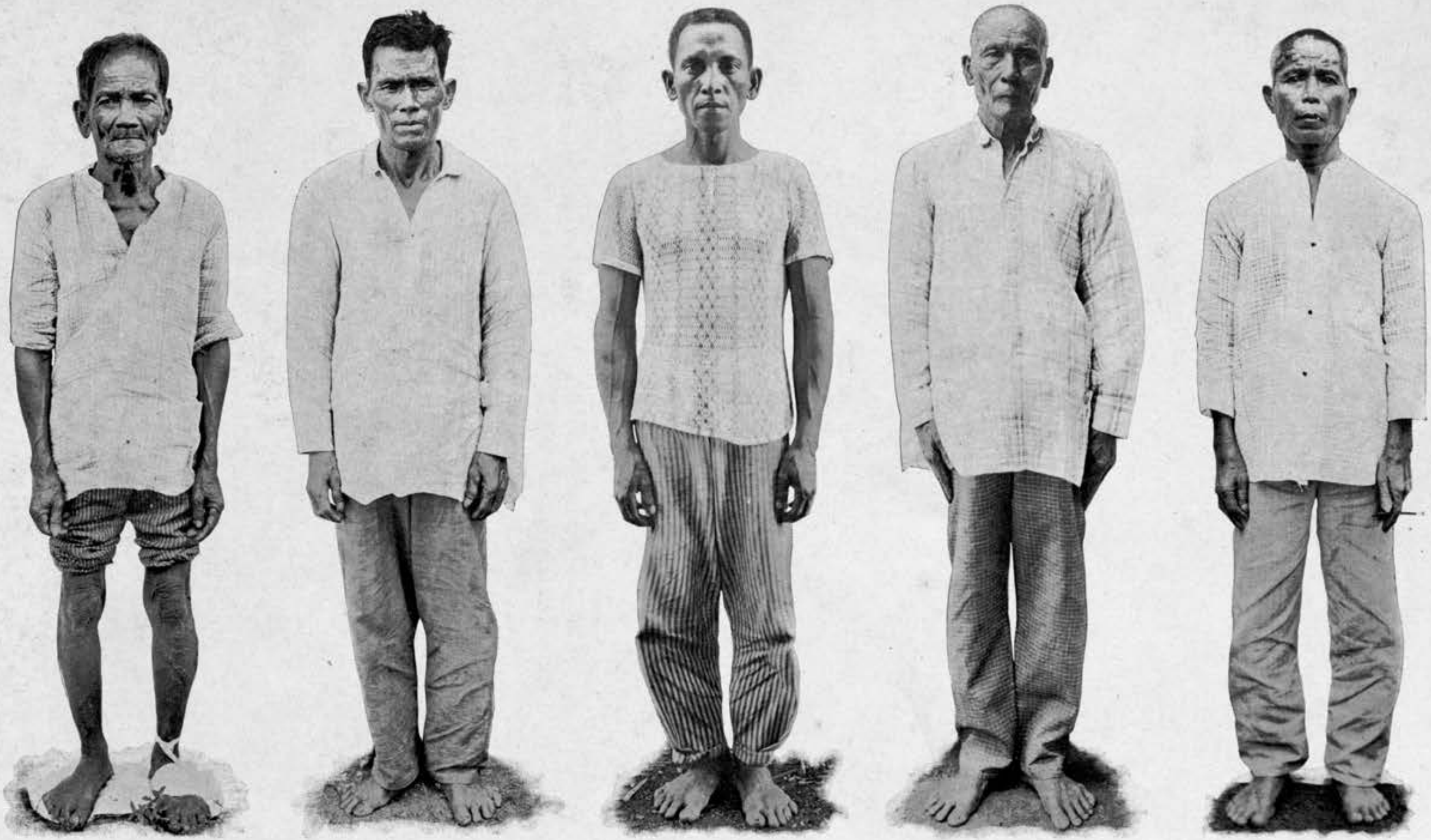
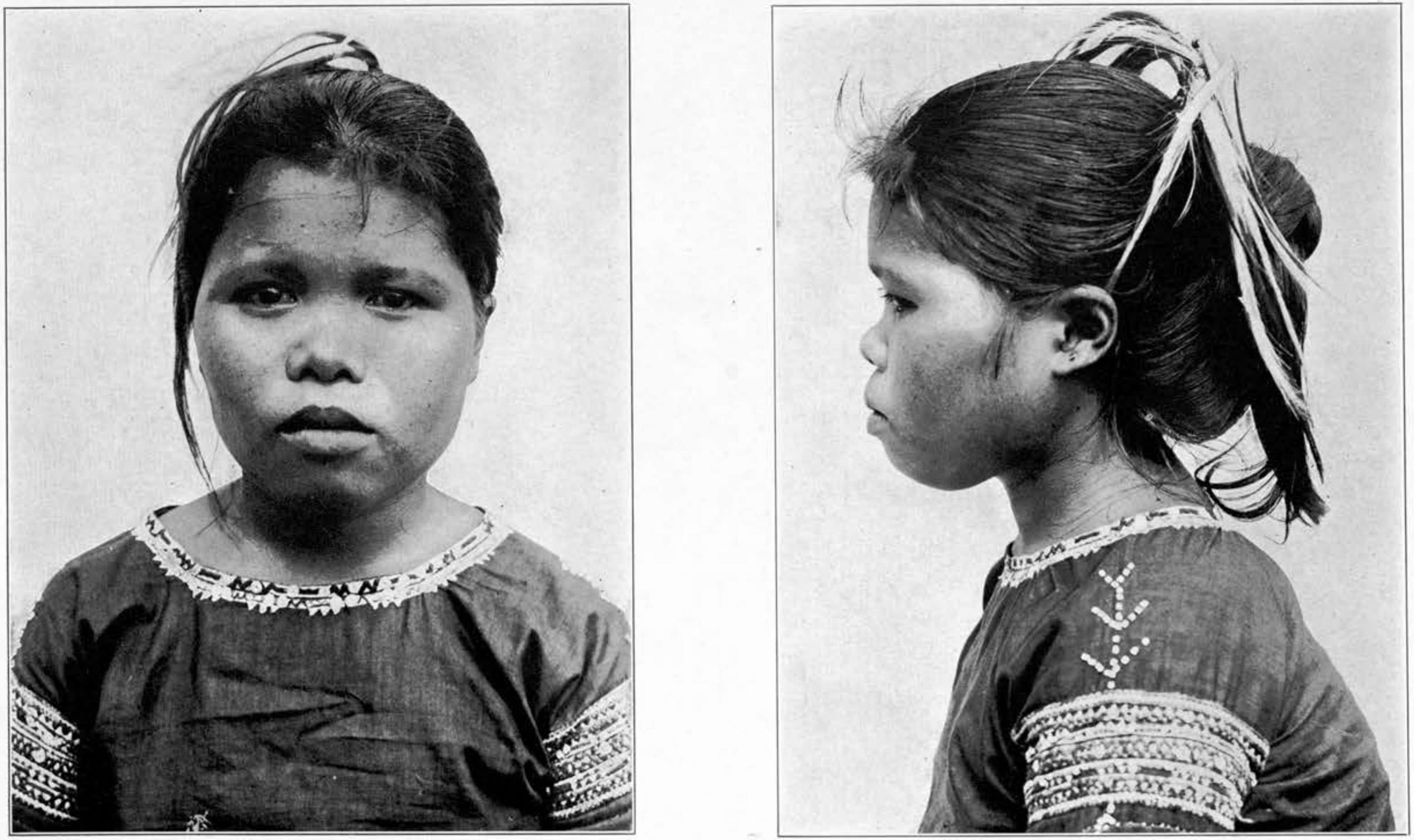
[2] All head outlines were made with the cephalograph (7) unless otherwise stated, and they are all reproduced natural size.



Iberian D. Australoid. Iberian E. Cro-Magnon B. B. B. Modified B. B. B.

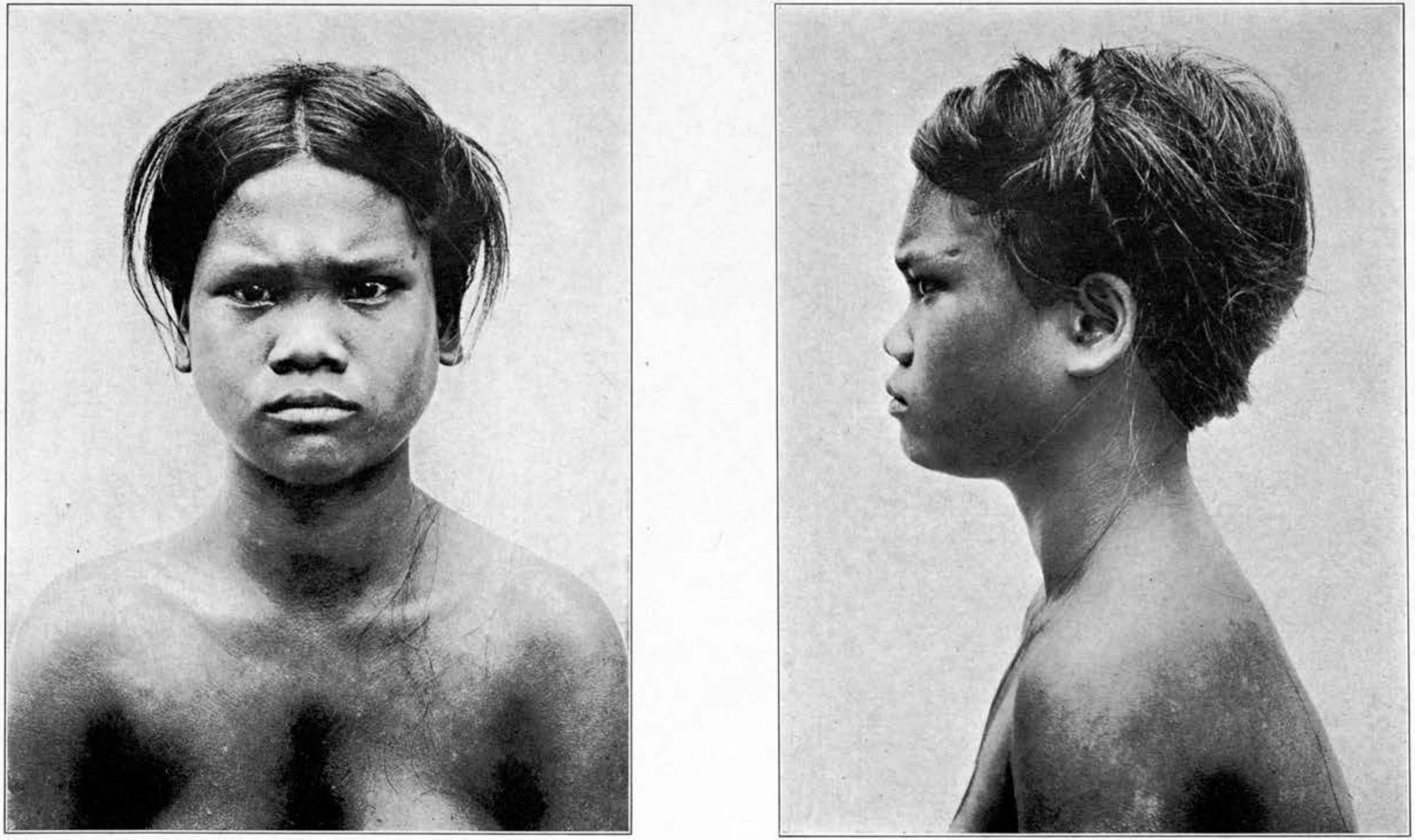
THE MEN OF TAYTAY.

PLATE I.



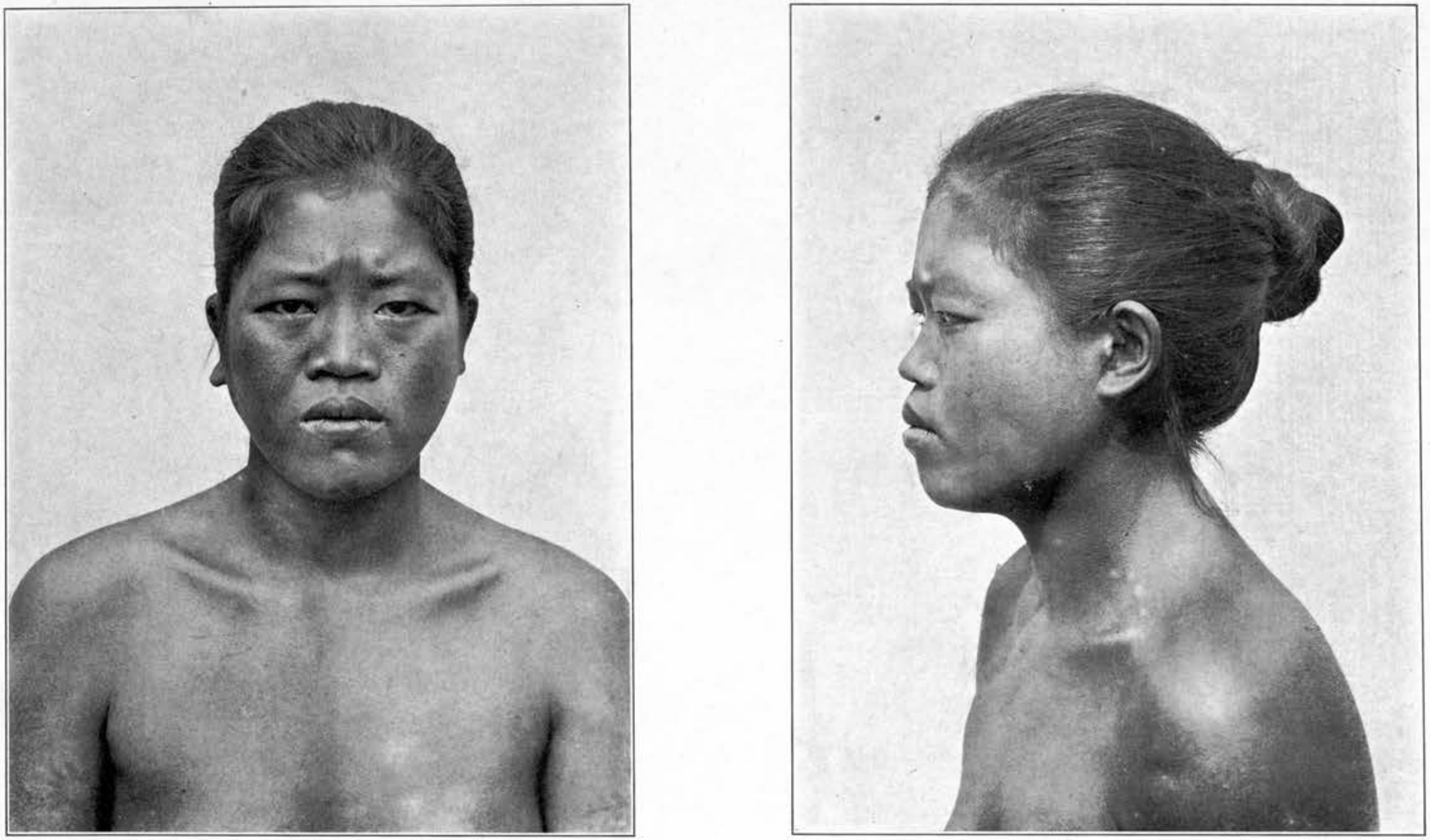
BOGOBO, DAVAO, MINDANAO. PRIMITIVE EAR AND PRIMITIVE SPECIES.

PLATE II.



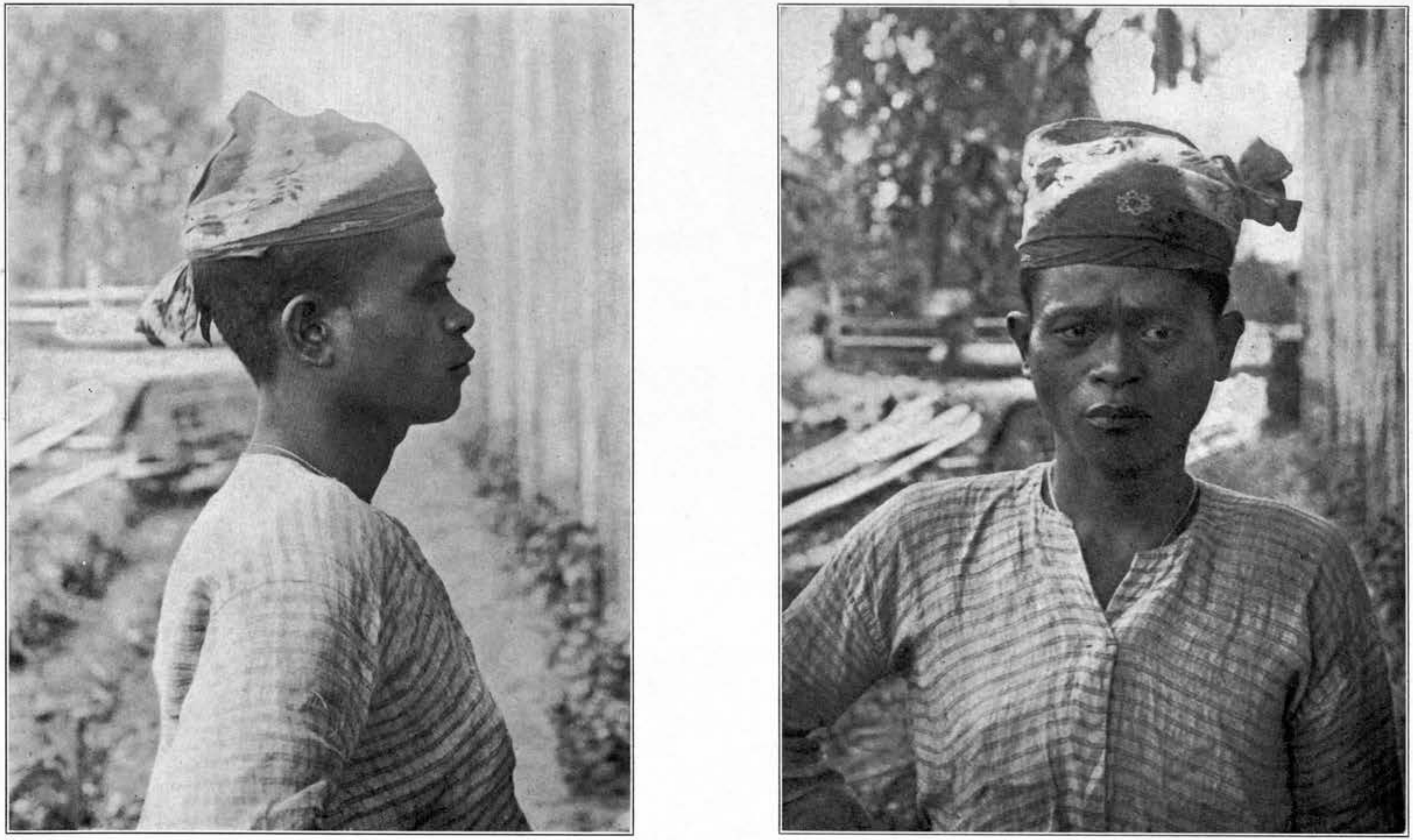
IFUGAO FROM QUIANGAN, NUEVA VIZCAYA, LUZON. PRIMITIVE EAR AND PRIMITIVE SPECIES.

PLATE III.



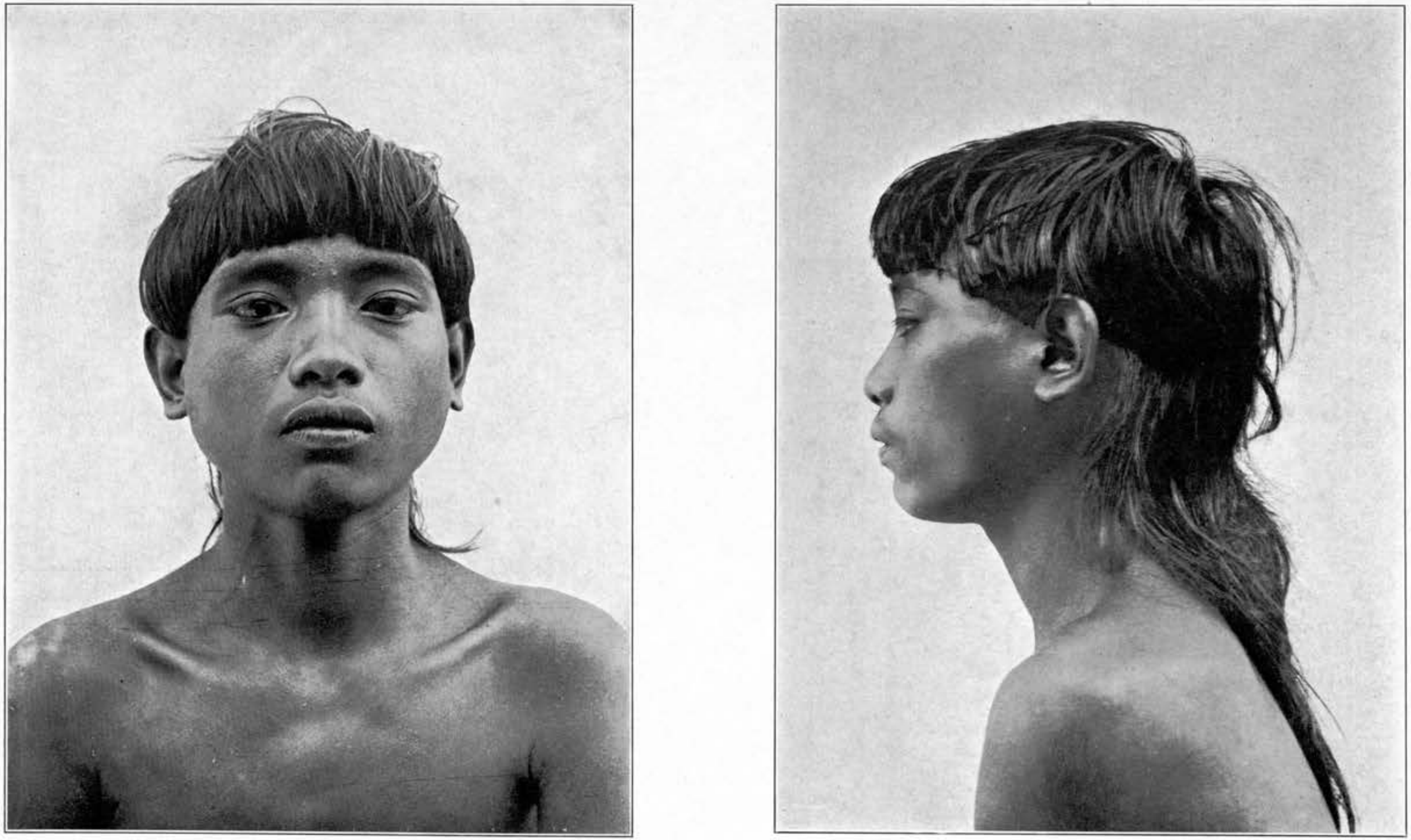
BONTOC IGOROT, MOUNTAIN PROVINCE OF LUZON. PRIMITIVE EAR AND MODIFIED PRIMITIVE SPECIES.

PLATE IV.



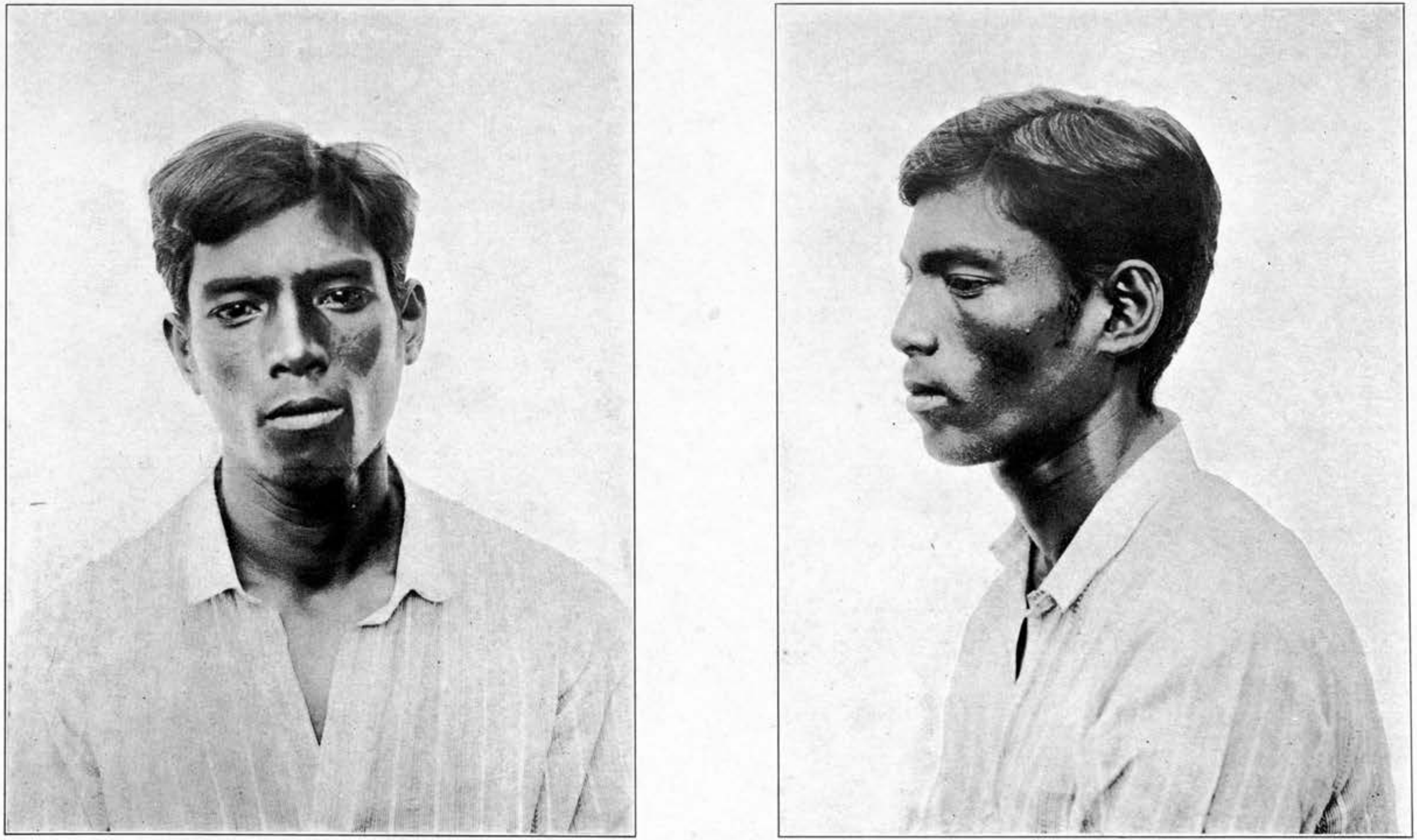
BUKIDNON FROM CAPIZ, ILOILO. PRIMITIVE EAR AND PRIMITIVE SPECIES.

PLATE V.



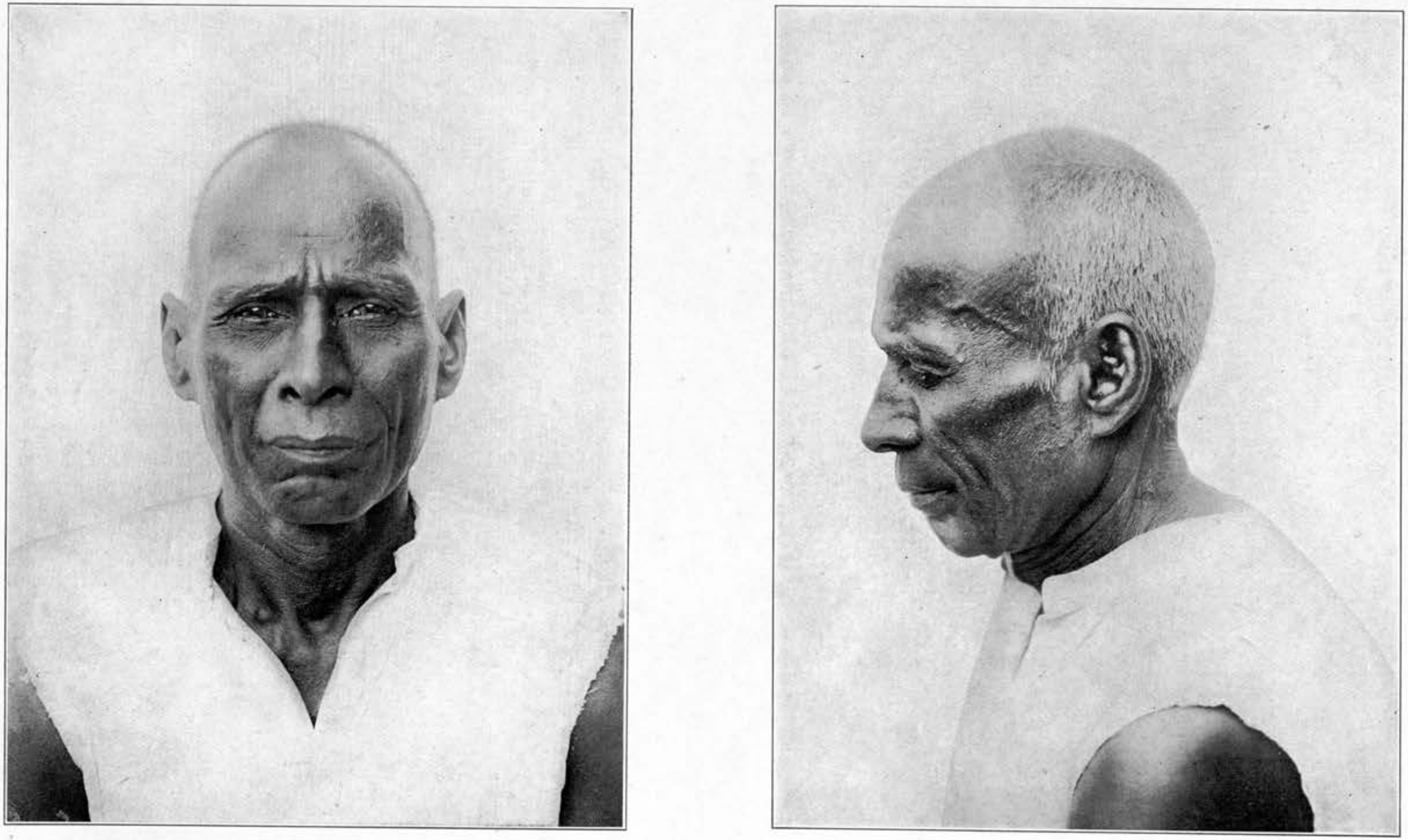
KALINGA FROM ILAGAN, ISABELA PROVINCE, LUZON. MIXED PRIMITIVE EAR AND MIXED PRIMITIVE SPECIES.

PLATE VI.



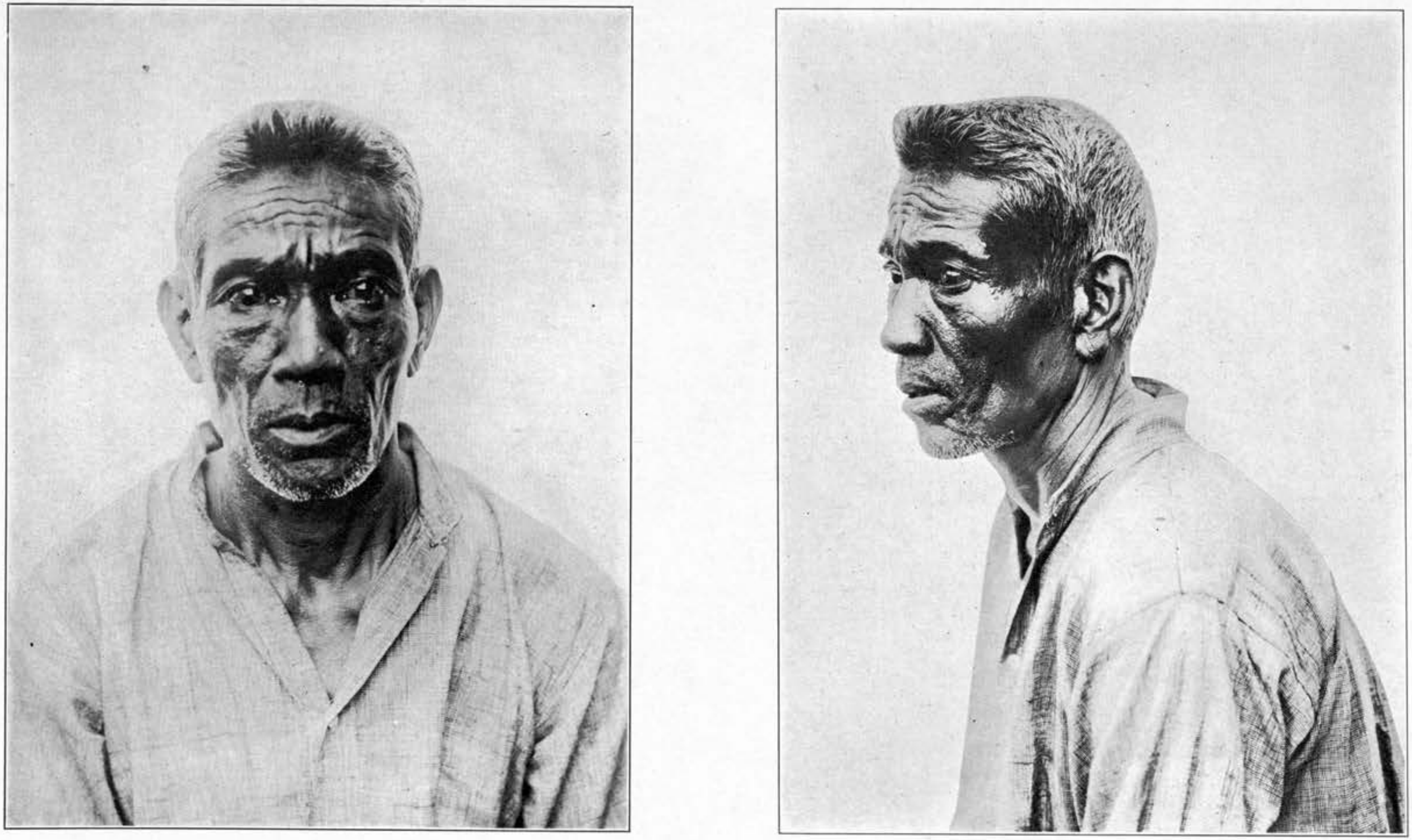
YOUNG MAN FROM CAINTA, IBERIAN. MODIFIED EAST INDIAN TYPE.

PLATE VII.



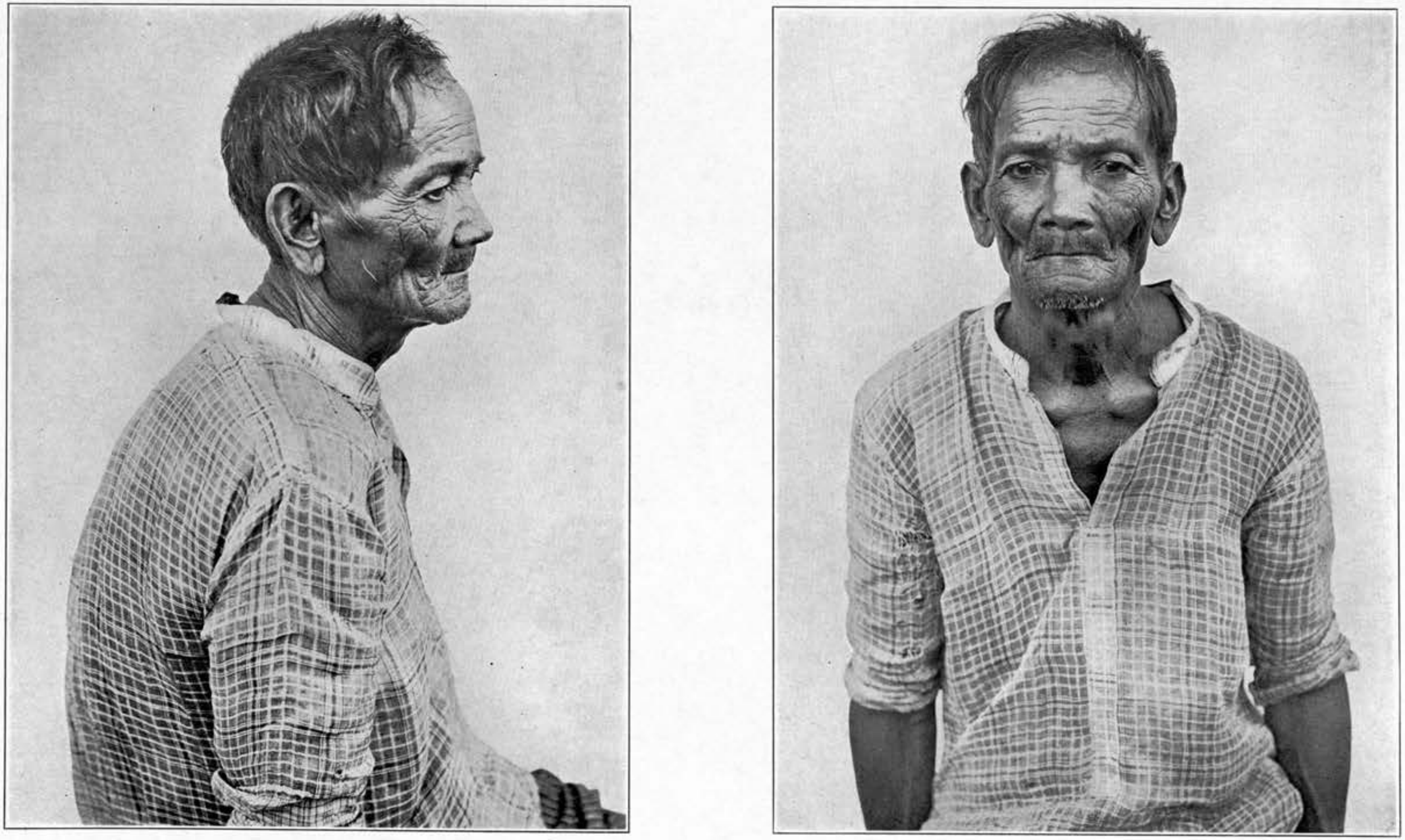
OLD MAN OF CAINTA. IBERIAN B MODIFIED. EAST INDIAN TYPE.

PLATE VIII.



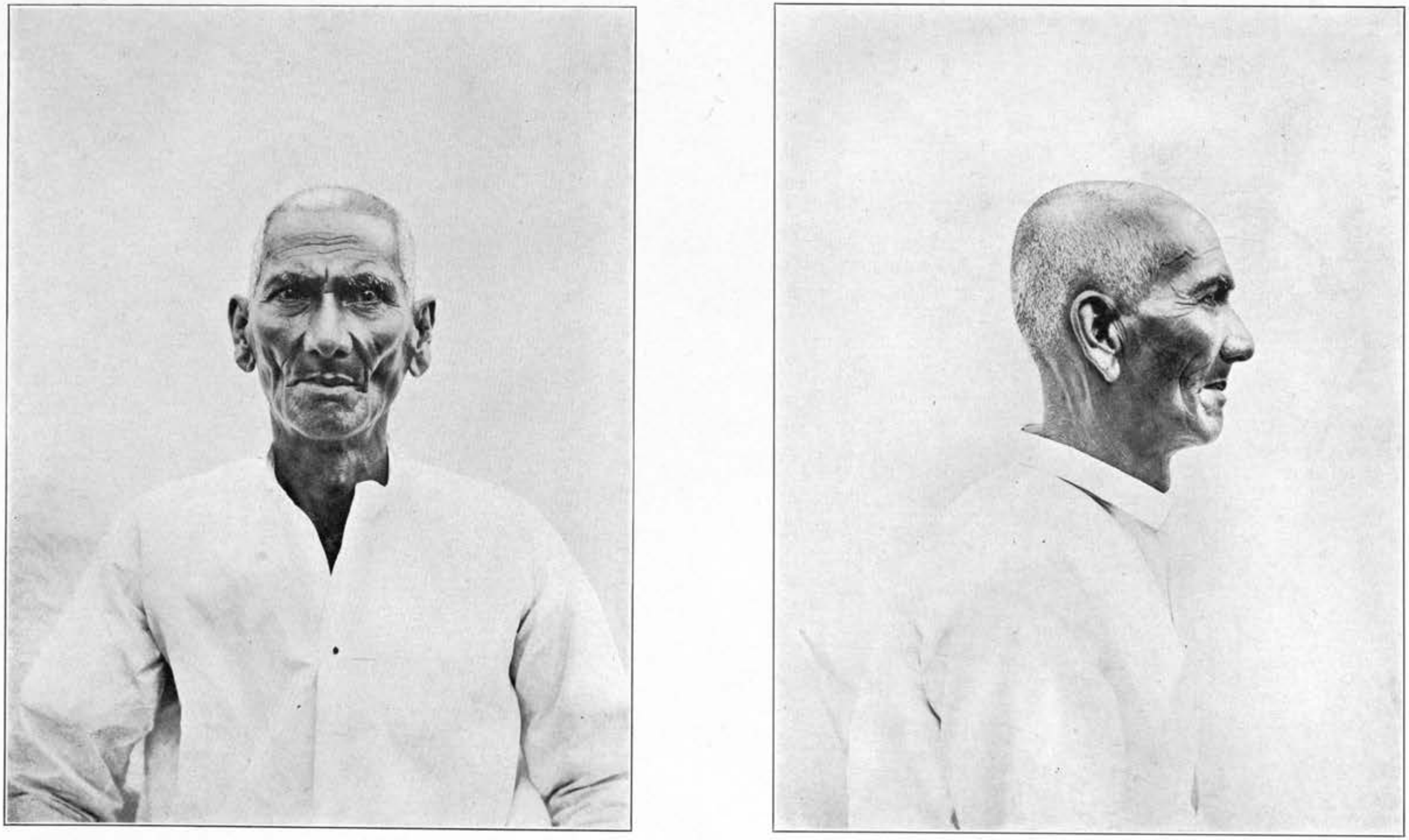
OLD MAN FROM CAINTA. IBERIAN D MODIFIED. CRO-MAGNON AFFINITIES. EAST INDIAN TYPE.

PLATE IX.



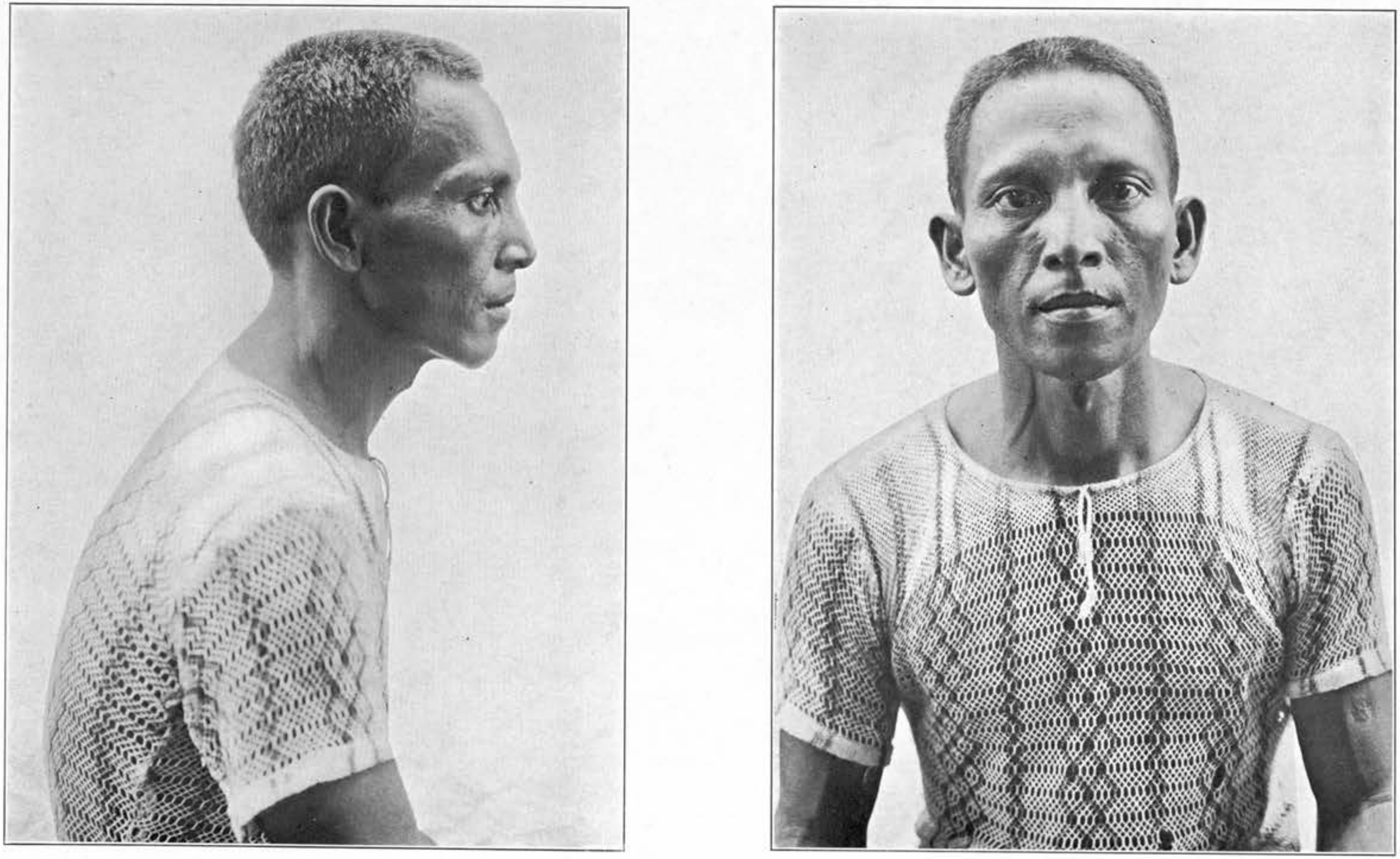
OLD MAN FROM NEAR TAYTAY. IBERIAN D. CRO-MAGNON AFFINITIES.

PLATE X.



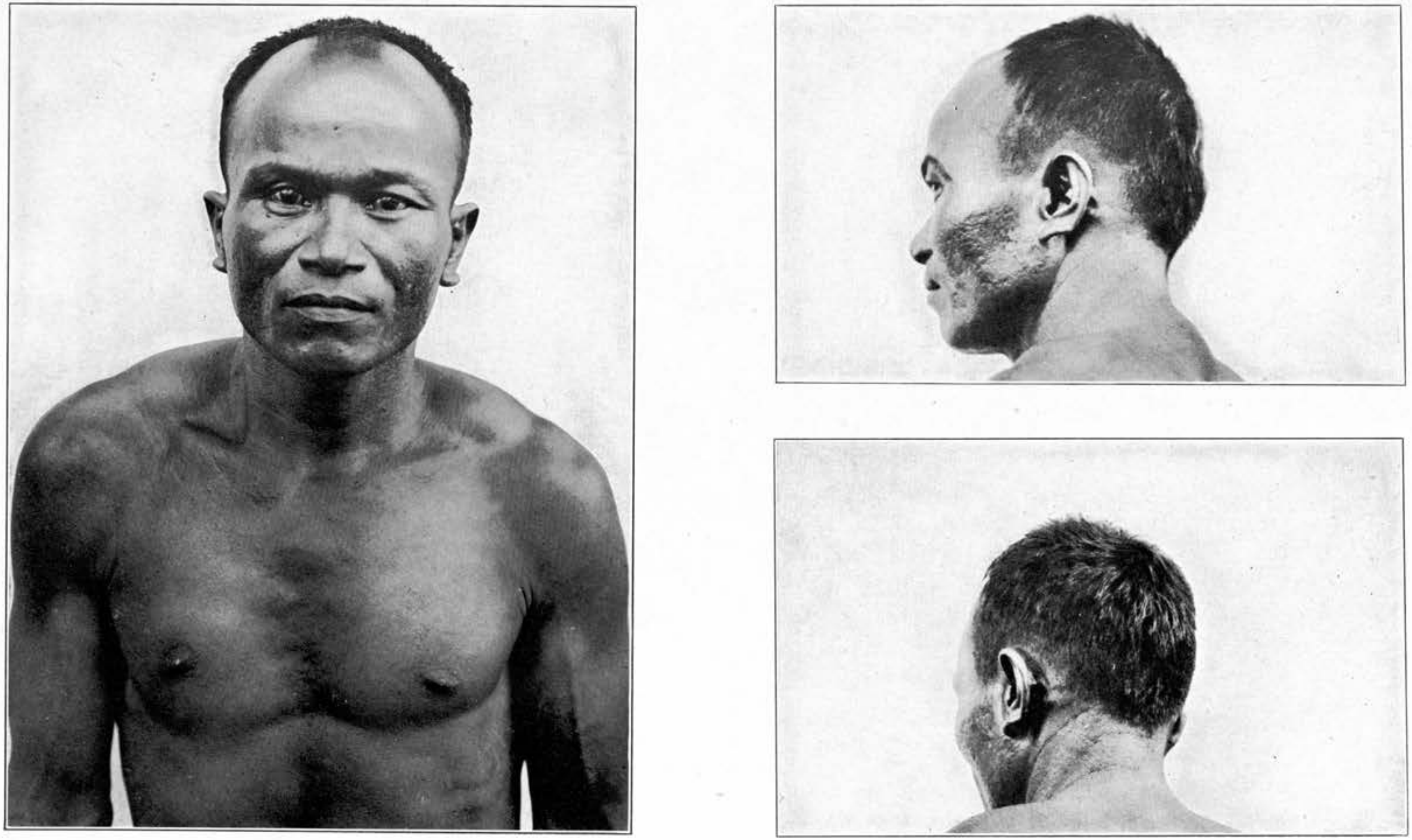
AN OFFICIAL OF TAYTAY. IBERIAN B AND D. CRO-MAGNON AFFINITIES.

PLATE XI.



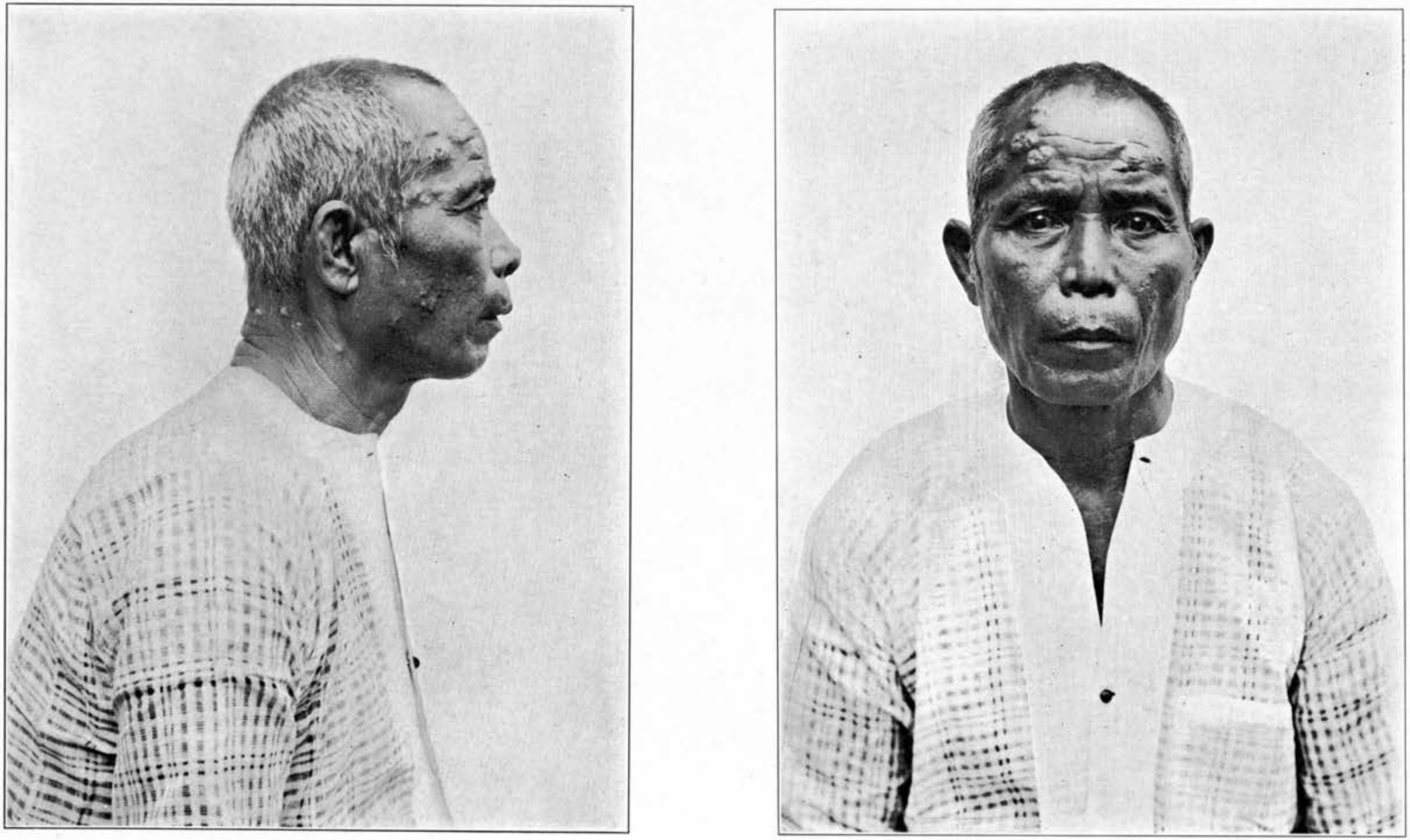
IBERIAN E. CRO-MAGNON AFFINITIES.

PLATE XII.



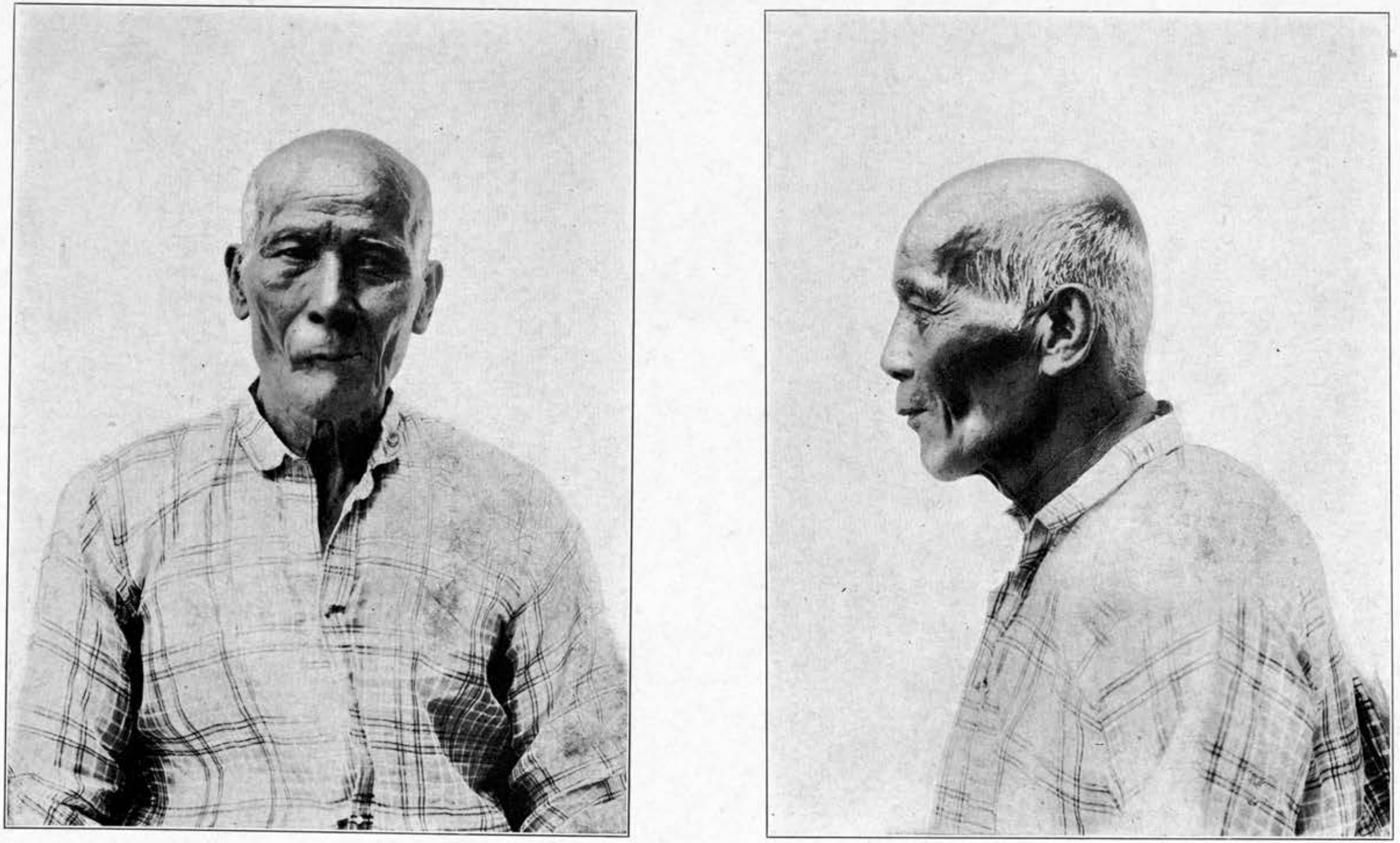
HAMMOCK CARRIER OF TAYTAY. ALPINE TYPE. ALPINE PRIMITIVE EAR.

PLATE XIII.



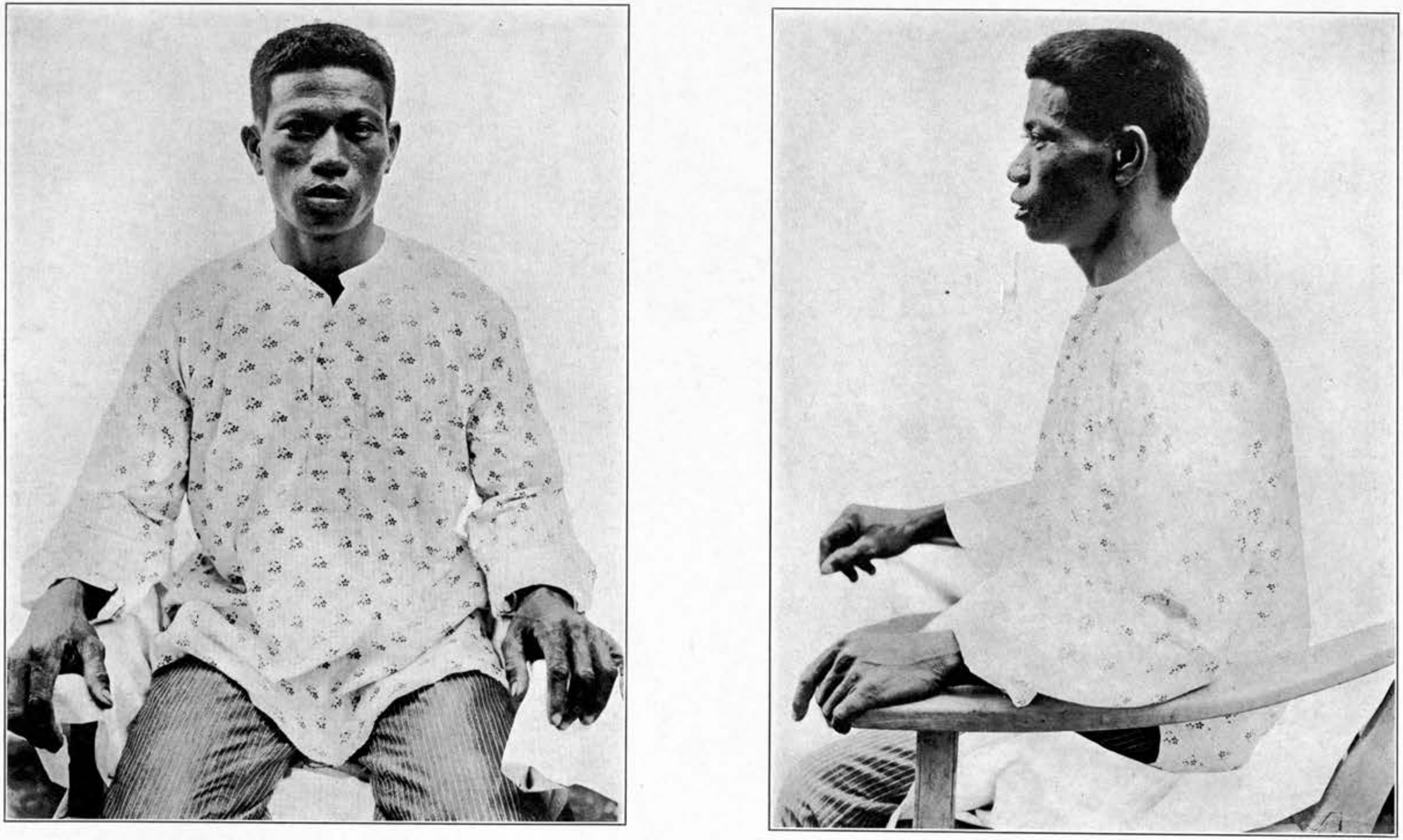
MODIFIED B. B. B.

PLATE XIV.



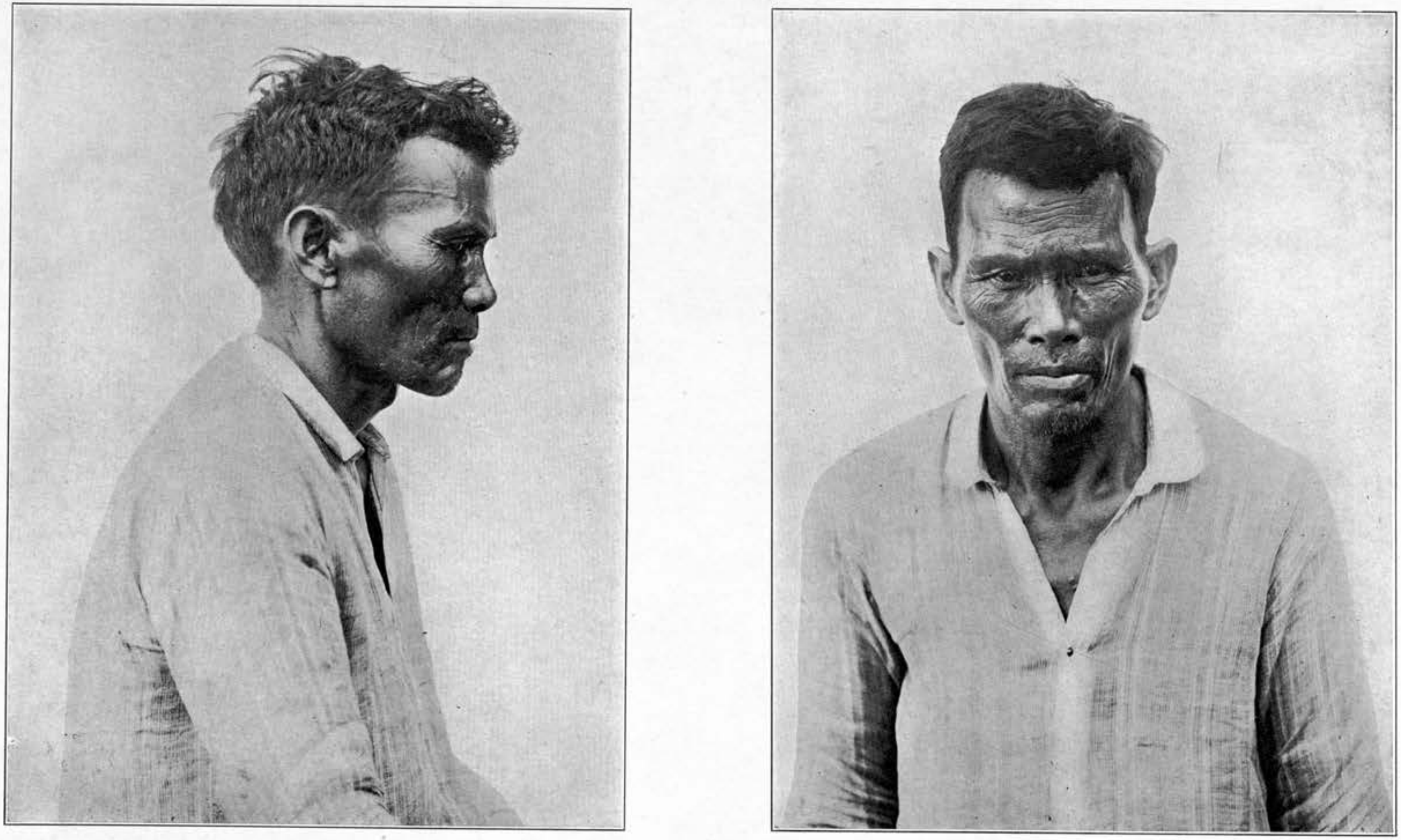
MODIFIED B. B. B. CRO-MAGNON AFFINITIES.

PLATE XV



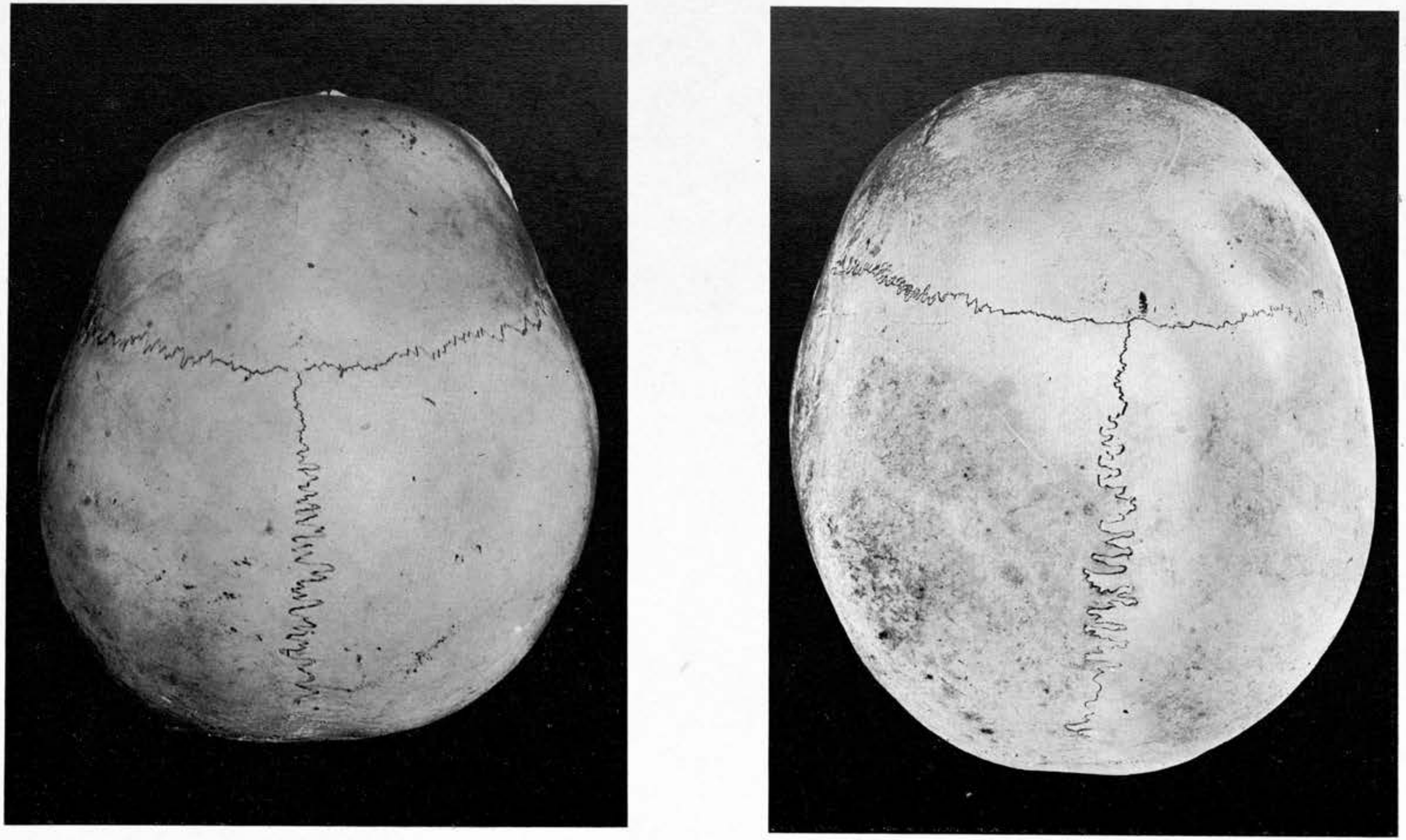
AUSTRALOID FILIPINO—SECONDARY VARIETY. IBERIAN AFFINITIES.

PLATE XVI.



AUSTRALOID FILIPINO—SECONDARY VARIETY. IBERIAN AFFINITIES.

PLATE XVII.



RIGHT DORSAL FLATTENING WITH LEFT CENTRAL BULGING IN TWO FILIPINO SKULLS.

PLATE XVIII.

A CEPHALOGRAPH: THE DESCRIPTION OF AN INSTRUMENT FOR REPRODUCING THE OUTLINES OF THE HEAD AND FACE.

By Robert Bennett Bean.

(From the Anatomical Laboratory of the Philippine Medical School, Manila, P. I.)

The value of an instrument that would accurately and easily produce the outlines of the head and face in any direction, through or over any plane, has long been recognized by anthropologists, and the instrument here described and pictured is presented with the hope that it will fulfill the requirements. The idea of the construction of a *cephalograph* occurred to me as early as 1905 when I used a machine for obtaining the outlines of the brain which would reproduce only the silhouette of the object but which could not be applied to the surface. At that time I spoke to Dr. Ales Hrdlicka who encouraged me to attempt the construction of such a machine, but the opportunity for its construction did not arise until I reached the Philippines in June, 1907.

In 1906 I consulted Prof. L. Manouvrier who was at that time working on a machine designed for the purpose of obtaining outlines of the head on the living, and I am grateful to him for any suggestions that may have been utilized in the construction of the *cephalograph*. The principles involved in the cranial instruments of Prof. Rudolph Martin[1] have been utilized, especially the pantograph to reproduce the exact outlines, the use of which occurred to me after my acquaintance with Professor Martin's instruments. The castings were made of aluminum through the kindness of my brother, Mr. Wyndham Randolph Bean, superintendent of the plants of the T. H. Symington Company at Rochester, New York, for whose interest in and personal supervision of the work I am greatly thankful. The measuring arm of the machine was made by Filipino students at the Philippine School of Arts and Trades in Manila, under the direction of Mr. Hewitt. To Mr. Hewitt I am also indebted for coöperation in constructing another *cephalograph* for the Bureau of Education of the Philippine Isalnds.

The *cephalograph* consists essentially of an aluminum frame supported by two vertical steel bars 1 meter long and 2 centimeters in diameter, fastened by brackets at each end to a board screwed to a frame or to any wall or post. The aluminum frame supports, by two parallel rods of the same diameter but only half as long, a horizontal aluminum bar,

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[1] Ueber einige neure Instrumenten und Hilfsmittel fur den Anthropologischen Unterricht. *Correspondenz-Blatt der Deutscher anthropologischen Gesellschaft.* (1903), No. 11, pp. 127–132.

1 meter long and 12.8 centimeters wide, on which a sliding brass piece supports the pantograph with the measuring arm. A smooth board on which drawing paper is held by thumb tacks is clamped to the end of the horizontal bar. The aluminum frame has a horizontal aluminum rod inserted at its middle, through the end of which another rod passes vertically to carry the head rest. At the upper end the vertical rod works in a cylindrical joint which allows rotation through 360 degrees, and at the lower end is a ratchet attachment by which the head rest may maintain the head at any desired angle in the vertical plane. Four supports, only two of which are shown in Plate I, serve to fix the head so that it remains rigid while the outlines are being made.

A unique feature of the *cephalograph* is the measuring arm of the pantograph (Plate II), which has a semicircular brass bar with a radius of 25 centimeters interposed between its extremity and the adjacent joint in such a manner that the parts of the arm contiguous to the semicircular bar may glide from one end to the other of the bar, or may be fixed at any point, the end of the measuring arm remaining at the same point regardless of the position of the other parts of the arm.

On the end of the measuring arm is attached a small frame holding a wheel so that a rolling surface comes into contact at all times with the part being measured. The weight of the measuring arm and the rolling contact allow exactly the same pressure to be exerted continually without any appreciable effort on the part of the operator of the *cephalograph*.

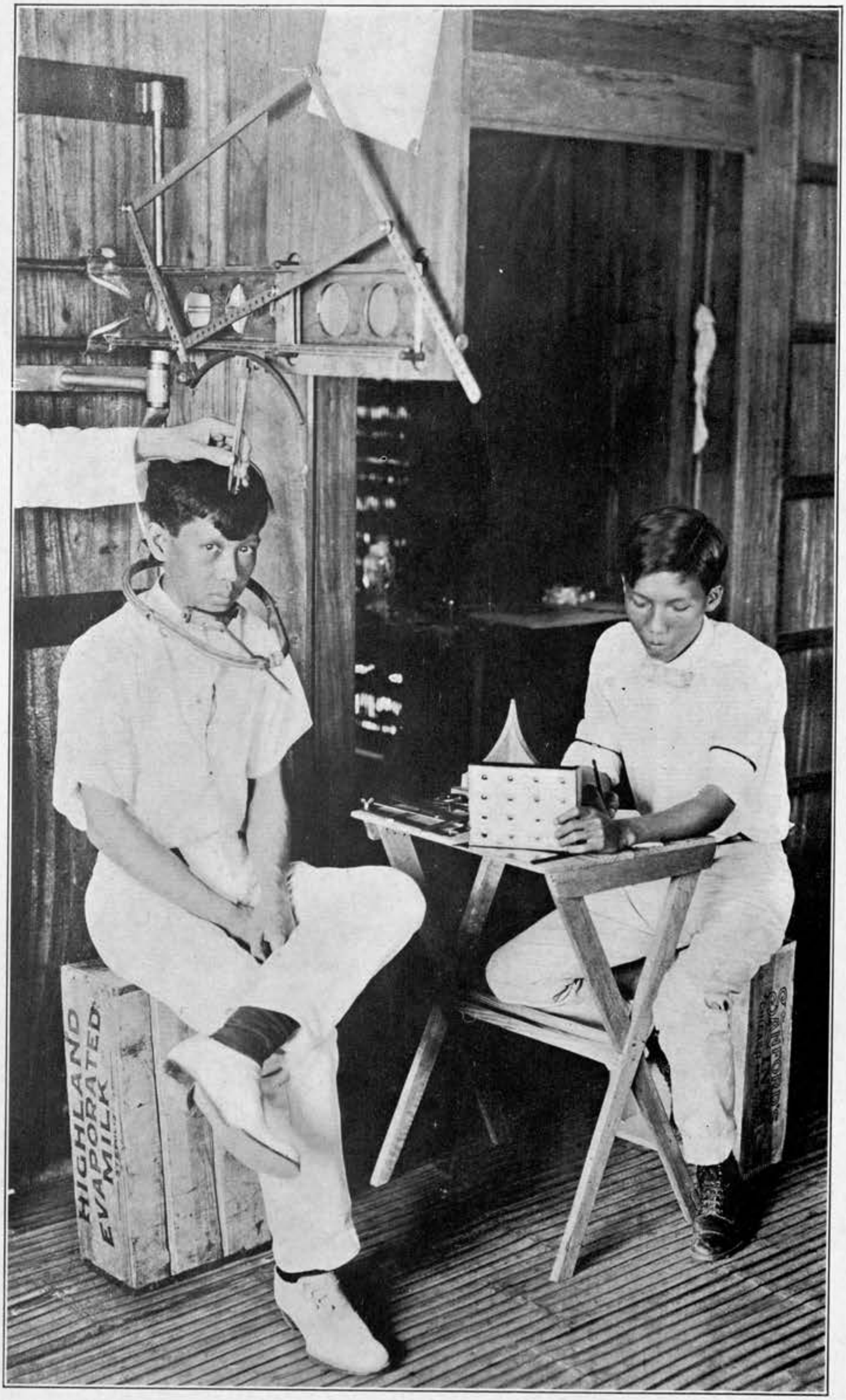
Coronal, sagittal and horizontal outlines of the head and face may be made easily and rapidly, and outlines in almost any direction are possible with a little manoeuvering. With the position shown in Plate I, only vertical longitudinal outlines can be made, but by rotating the head rest through an angle of 45° horizontally, coronal outlines are possible; then, by depressing the head rest until the face is prone and the horizontal position of the head assumes the vertical direction, horizontal outlines can be made.

The weight of the machine packed in a portable case is about the average load for a native carrier, about 30 kilos (75 pounds.)

It is to be hoped that the *cephalograph* will be used in schools and universities, as well as among the wild tribes and native peoples of the earth that are little known, and wherever the living may be measured. The *cephalograph* can also be used for measuring any solid body to which the attachment at the head of the measuring arm can be applied. For this reason it may be of service in measuring skulls and other bones as well as any objects of which the contour in any given plane is wanted, although slight alterations may be necessary if a complete circuit of an object is desired. Criticisms and suggestions will be gladly received, for I realize the imperfections of the instrument, but I believe it represents a distinct advance in the application of mechanics to the reproduction of the outlines of the head and face.

ILLUSTRATIONS.

PLATE I. The cephalograph in operation at Taytay, Rizal Province, Luzon, in 1909.
II. The measuring arm of the pantograph.



VENTRO-LATERAL VIEW OF THE CEPHALOGRAPH AT WORK AT TAYTAY, PROVINCE OF RIZAL, ISLAND OF LUZON, IN 1909.

PLATE I.

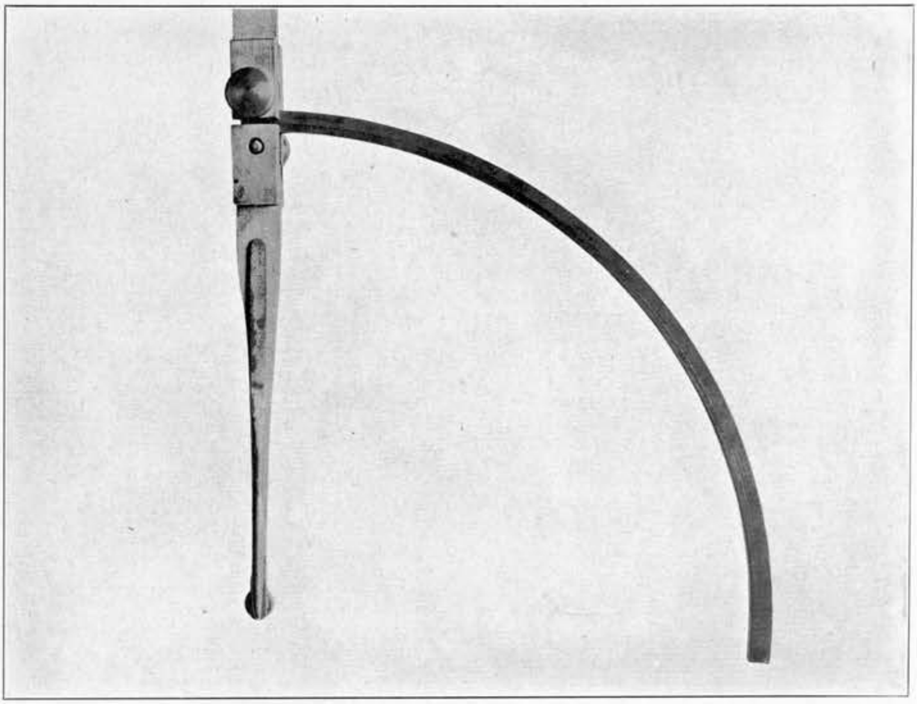


FIG. 1. THE MEASURING ARM OF THE PANTOGRAPH. THE SIDE FACING THE OPERATOR OF THE CEPHALOGRAPH.

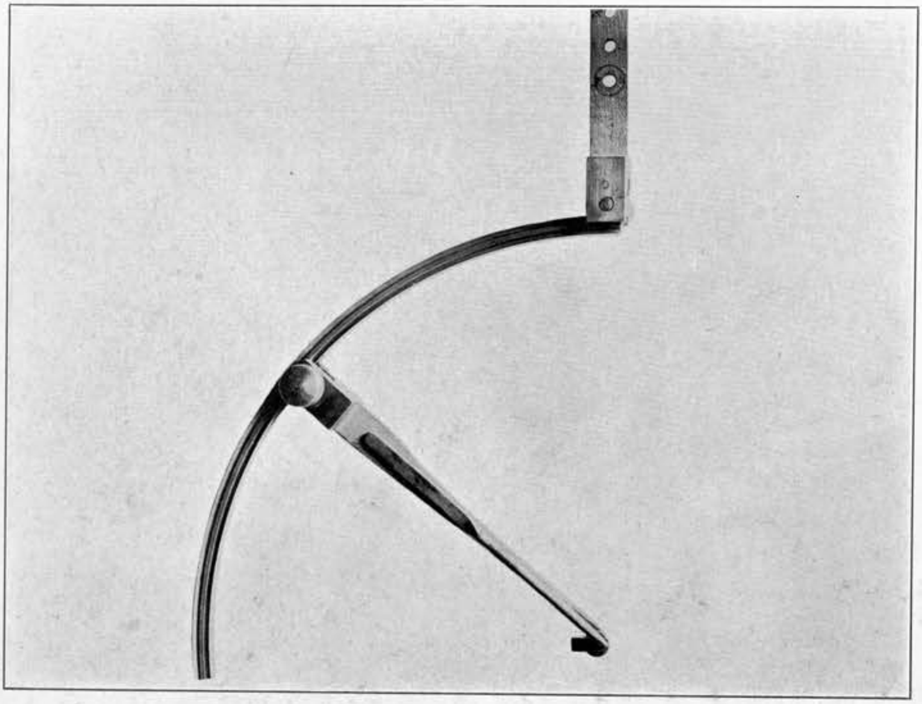


FIG. 2. THE REVERSE SIDE, SHOWING THE DISTAL END OF THE ARM IN A DIFFERENT POSITION.

PLATE II.

THE ACTION OF ORGANIC PEROXIDES ON THE PHOTOGRAPHIC PLATE.

By Benjamin T. Brooks.
(From the Chemical Laboratory, Bureau of Science, Manila, P. I.)

With the recent development of our knowledge of radioactivity, the action of many substances on the photographic plate has been studied and in some cases this property has been taken as a test for radioactivity. This property alone is not sufficient to characterize a body as being radioactive, as is very generally recognized. Nevertheless papers still continue to find their way into the chemical literature ascribing radioactivity to certain substances which affect the photographic plate but which have little or no semblance to the heavy metals.

That the "pseudo-radioactive" substances are not radioactive in the same sense as the heavy metals has been shown by Russell, Saeland and Ebler.

Russell[1] has described recently the action on the photographic plate of colophony and a number of substances which contain resin. He has shown that the shadows thrown by resin are not bounded by straight lines, but curve round a screen; that the action is not capable of passing through glass, mica, or aluminium foil, even of extreme thinness, and does not affect an electrical field. The action can pass along a bent glass tube, and may be swept out of a tube by a slow current of gas. No action takes place in an atmosphere of carbon dioxide. Heat destroys the activity and previous exposure to sunlight accelerates it. Alkalies or sulphur dioxide destroy the activity. When the activity of a specimen is destroyed by any of the above means, exposure to oxygen and light restores it. Russell also prepared crystalline abietic acid and found it to be active. Turpentine and specimens of pure pinene and limonene after exposure to air showed the same behavior. A similar behavior of linseed oil is described by him[2] in a previous communication.

Russell states that the effect appears to be produced by a vapor rather than by any form of radioactivity. He had previously shown[3] that the vapors of hydrogen peroxide affect a photographic plate, even in dilutions of one part in a million. He suggests that this may be the active substance.

Saeland[4] has recently shown that the action on the photographic plate of the alkali metals, magnesium, zinc and other metals which have a high solution tension, is due to hydrogen peroxide formed by the oxidation of the metal in the presence of moisture.

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[1] *Proc. Roy. Soc. Lond.* (1908), **B, 80,** 376.

[2] *Proc. Roy. Soc. Lond.* (1898), **63,** 102.

[3] *Proc. Roy. Soc. Lond.* (1899), **64,** 409.

[4] *Ann. d. Phys.* (1908), **26,** 899.

Ebler[5] has recently confirmed this view by exposing certain metallic peroxides in moist air to photographic plates. The effect produced was the same as that described by Russell and Saeland.

Russell made no attempt to explain the formation of hydrogen peroxide by the organic substances studied by him or to call attention to the fact that they are capable of forming organic peroxides by autoxidation. The conditions under which the activity is destroyed or increased are strongly suggestive of an intimate connection with organic peroxides.

That organic peroxides are slowly hydrolyzed by water with the formation of hydrogen peroxide has been shown by Freer and Novy[6] and by Clover and Richmond.[7] This fact offers a plausible explanation of the formation of hydrogen peroxide and the consequent change in the photographic plate produced by the substances studied by Russell.

In order further to test this theory benzoperacid, acetyl peroxide and benzoylacetyl peroxide were tested and each substance was found to affect a photographic plate.

The experiment was carried out by placing about 0.1 gram of the substance on a moist piece of filter paper in a shallow crystallizing dish and covering the dish with a photographic plate. In the case of acetyl peroxide a distinct dark spot was obtained on developing the plate after an exposure lasting twenty minutes. Benzoylacetyl peroxide gave a distinct spot after about 45 minutes. If the plates were exposed too long a reversal, or positive, was obtained.

In a study of Manila copal it was found that the substance rapidly absorbed oxygen from the air and that the powdered resin affected a photographic plate in the same way as colophony. Russell stated that amber was very feebly active compared with colophony. In order to ascertain if the older fossil resins could be differentiated in this way from the more recent ones, several samples of Manila and other copal resins were exposed to photographic plates.

About 10 grams of each specimen of copal were pulverized and placed in a shallow crystallizing dish. A photographic plate was then placed with the film side down upon each dish. At the end of one week the plates were developed in the usual manner and in all cases a round dark spot sharply outlining the dish was obtained. Samples of recently collected, semi fossil and partially distilled Manila copal gave very dark spots. A specimen of kauri copal gave a much blacker spot than Manila copal, which probably has some connection with the fact noted by Worstall[8] that the oxidation of kauri is the faster of the two. Zanzibar copal gave a fainter spot than kauri or Manila and a specimen of hard brittle resin from Philippine coal showed the least activity of all.

[5] *Ztschr. f. angew. Chem.* (1909), **22**, 205.

[6] *Am. Chem. Jour.* (1902), **27**, 161.

[7] *Am. Chem. Jour.* (1903), **29**, 179.

[8] *Journ. Am. Chem. Soc.* (1903), **25**, 863.

In order to determine whether or not the resin acids in Manila copal would, like abietic acid, affect the photographic plate in the absence of terpenes, the following experiment was tried.

About 50 grams of powdered copal were dissolved in cold dilute alkali and the solution extracted four times with ether. The solution was then evaporated to one-half its volume on the steam bath to expel the ether. The solution was diluted and the resin acids precipitated by dilute hydrochloric acid. Ten grams of the dried acids were exposed to sunlight for one half day. A photographic plate was then placed over the substance and on developing the plate four days later a distinct black spot was obtained.

The above explanation of the action on the photographic plate of certain organic substances was suggested by a study of the autoxidation of Manila copal, but in view of the interest recently shown in this peculiar phenomenon it is published at the present time while the work on Manila copal will appear at a later date.

TESTS OF PHILIPPINE ROAD MATERIALS.

By George I. Adams.

(From the Division of Mines, Bureau of Science.)

Sometime ago the engineer of the city of Manila requested that the division of mines of the Bureau of Science find a quarry site which would supply a superior quality of stone for macadamizing the streets. The importance of this problem will be seen when it is realized that the city uses each year in surfacing streets about 50,000 cubic meters of crushed stone, which costs delivered in Manila about ₱2.50 per cubic meter. The quality is not satisfactory and any improvement in the quality of the material used would be evident in the better character of the streets and a saving in the cost of maintenance.

Abrasion machine.—It is obvious that in recommending a change of the quarry site one should not trust simply to his judgment, but should be able to base his recommendations on reliable tests. When geologic work was begun for the purpose of finding a better stone, there were no appliances in the Islands for testing stone for use as road material, and it seemed undesirable to resort to the only remaining method of making a practical test by macadamizing certain streets with different materials available, and waiting for the results of actual wear to show which material is the most desirable. A properly equipped laboratory should be supplied with apparatus for submitting stone to the abrasion test and determining its cementing value, toughness, absorption, hardness, specific gravity, and strength. Most of this apparatus is relatively expensive, and some of it, being of special design, can not be constructed easily. For the abrasion test, however, which is the one which most closely corresponds to the conditions of actual wear, a machine that can be constructed readily is required and accordingly one was designed. Castings were made in Manila, and the machine was completed and set up by the engineer of this Bureau. The Devall type of machine first constructed in France and accepted and used by the Road Material Laboratory of the United States Department of Agriculture at Washington, was selected, in order that tests might be carried on in conformity with accepted standards, and comparisons made with the results obtained in the Washington Laboratory, which has been in operation for a number of years.

The Devall abrasion machine consists essentially of two iron cylinders fastened to a shaft so that each cylinder is at an angle of 30° with an axis of rotation. Each cylinder is 20 centimeters in diameter and 34 centimeters in depth, closed at one end and having a tightly fitting iron cover for the other. In testing stone with this machine it is broken into pieces of as nearly uniform size as possible, each of which will pass in all positions through a 6 centimeter ring. Five kilograms approximating as closely as possible to 50 pieces of rock previously cleaned by washing and subsequently dried in an oven and then cooled in a desiccator, is used as a charge for each cylinder. The machine is rotated at the rate of 2,000 revolutions per hour for five hours, the inclination of the cylinders causing it to be thrown from one end to the other twice at each revolution. When the abrasion of the material is completed, the contents of each cylinder is placed on a sieve having openings of 0.16 centimeter, and the material which passes through this is caught on a sieve having openings of 0.025 centimeter. Both sieves with the rock held on them are placed under running water until all the dust is washed off. These fragments are then dried in a hot air bath and cooled in a desiccator and weighed.

Percentage of wear.—The percentage of wear indicates the amount of the original sample which was worn to fines less than 0.16 centimeter in size during the test. Theoretically, this percentage of wear may vary from 0 to 100, but materials which show 20 per cent or more of wear are considered unfit for use. Some materials will show less than 2 per cent of wear.

French coefficient.—The French coefficient, which is an arbitrary one, is determined by dividing 2,000 by the weight of the fragments under 0.16 centimeter in size, which are worn off during the test. According to this standard, the scale of excellence would vary from 0 to 20, with some material passing 20.

United States coefficient.—In reports of the road material laboratory at Washington, the United States coefficient is also given, which is found by dividing by 10 the weight of the material over 3 centimeters in size which remains after the test.

Report of a series of tests.—Inasmuch as the French coefficient is an arbitrary standard and the United States coefficient does not express so directly the wear in actual use on the roads, it is not considered necessary to record them, although they have been computed in all the tests made in this Bureau. The following table is a summary of the abrasion tests thus far made on road materials used in the Philippines. It is presented for the information of those who are in charge of the construction of roads with the hope that it may indicate the wide range in the character of the stone used and show that in many cases a considerable economy may be effected by carefully selecting the quarries.

Rock varieties.	Textures.	Localities.	Number of samples.	Percentage of wear.
Basalt	Dense	Talim Island, Manila city quarry	3	2.57
Do	Vesicular and scoriaceous.	do	1	8.66
Do	Dense	Road from Antipolo to Taytay, Rizal	3	2.61
Do	Vesicular	do	1	4.60
Andesite	Crystalline	Los Baños quarry, Laguna	2	2.66
Do	do	Sisiman quarry, Bataan	2	4.08
Do	do	Arayat quarry, Pangasinan	1	2.62
Do	Vesicular	do	1	3.54
Do	Crystalline, but weathered.	Sea beach below Batangas, used in road from Batangas to San Juan.	2	3.79
Gabbro	Dense, fine grained.	New Manila city quarry, Angono, Rizal.	1	2.17
Do	Brecciated	Old Spanish quarry, Angono, Rizal	1	2.31
Diorite	Gravel, crystalline	Benguet road	1	4.98
Diorite and andesite	do	do	1	2.67
Diorite	Crystalline	Sara-Ajuy road, Iloilo	1	1.76
Limestone	Dense	Montalban, Rizal	2	3.97
Do	do	Sibul Springs, Bulacan	2	3.77
Do	Porous	San Esteban, Ilocos Sur	1	4.55
Do	Dense	Danar, Ilocos Sur	1	3.67
Do	Porous	San Fernando, La Union	2	5.73
Do	Dense	Benguet road	2	4.34
Do	Dense, argillaceous	do	2	6.09

Stone used for the streets of Manila.—During the Spanish régime very few streets of Manila were macadamized, and these only imperfectly. The streets which were well improved were, for the most part, paved with granite blocks imported from Hongkong as ballast. In addition, paving blocks were cut from an andesite near the present Sisiman quarry, which is situated near Mariveles at the entrance to Manila Bay. Also at several places near Angono, Binangonan and Talim Island, basaltic and gabbroic paving blocks were made in a desultory way. Samples of these classes of block pavements can be seen in Manila to-day, and the mode of wear of the paving blocks is a fair index to the quality of the stone for macadam. At the beginning of the improvement of the streets by the American authorities, some crushed stone was obtained from the Binangonan quarry. This quarry has a very limited face, the stone varies in texture, and, accordingly, is unsuitable for large operations and was soon abandoned. The next place where quarrying was carried on extensively was on Malagi Island just southeast of Talim Island. The establishing of quarries there came about through using the island as a prison and the effort to employ the convicts at manual labor. The stone was not of superior quality and when the island was abandoned as a prison colony, the quarries were discontinued. The present plant operated by the city is on the northwest part of Talim Island at Subay, where a crushing plant operated by steam and supplied with convenient tracks, bins, and facilities for dumping into scows, is still in operation, but shows the results of heavy usage. The stone at this quarry is of about the same character as at Binangonan and Malagi. The better qualities are a dense basalt, which has a conchoidal and splintery fracture and shows 2.57 per cent of wear. With it there is a variable vesicular and sometimes scoriaceous variety showing 8.66 per cent of wear, and the gradation into this quality is so irregular that in quarrying it is very difficult to separate the two. Moreover, the processes of weathering have attacked the poorer and softer stone and the quarry at Talim contains considerable dirt, so that it is impossible to obtain continuously a clean, uniform crushed stone.

A careful survey was made of the zone which embraces Talim Island and Binangonan Peninsula. No better material was found occurring in relations suitable for quarrying. The zone is characterized by flows of basaltic lava, varying from dense to vesicular and scoriaceous varieties, and a large part is covered with volcanic agglomerate and braccias, which grade into tuffs.

When the United States Army built the road between Los Baños and Calamba, they opened a quarry near Los Baños. The rock is a crystalline andesite, usually quite dense in texture. There is a high face of rock which rendered quarrying easy and a small crusher was installed which gave a very satisfactory output. It shows 2.66 per cent of wear. Besides using the stone on the road near Los Baños, a considerable quantity of it was transported to Fort McKinley and used in macadamizing the streets of that post. The city of Manila has been deterred from using this quarry because it was thought not to furnish the best quality of rock which could be obtained, and that the transportation which would include that by land to the shore of the lake and a long towage across to the mouth of the Pasig River would make the cost too high.

The quarry at Sisiman, near Mariveles, was opened for the purpose of supplying large stone for building the breakwater of Manila Harbor. The city was induced to try crushed stone from this quarry for macadam, and some streets were carefully prepared with it for the purpose of making a practical test, but it was found unsatisfactory since it is too soft and wears rapidly under the action of wheels, disintegrating into rock flour. Although the quality of the stone was soon determined, some additional attempts were made to use the screenings from it as a top dressing over the Talim rock, with a hope that it would serve as a binder. As it has a very low cementing value, this experiment was not successful, and the fact that the dressing consisted of fines containing a large amount of rock flour rendered the streets muddy and necessitated the removal of the dressing after the first heavy rains.

As soon as the abrasion machine was constructed, the Sisiman rock was tested and its percentage of water was found to be 4.08. This test demonstrated much more economically the unsuitability of the rock than did the practical test, and showed the value of using the abrasion machine.

In looking for a quarry site, the shores of the Bay Lake (Laguna de Bay) and Manila Bay were carefully explored as well as all points from which railway transportation appeared feasible. It was soon discovered that it would be impossible to ship stone by rail at the present freight rate, or even at such reduced rates as the company might be willing to concede, since the railway rates are high and seemingly excessive. No good quarry site was found on the immediate shore of the lake. The occurrence of hard rock on the shores of Manila Bay are all near the entrance, and most of them at places where the conditions for quarrying and loading are not favorable. Transportation across the bay could not be depended upon during rough weather, and this would be a serious handicap to the city since continuous operations are necessary in order to supply the amount of stone required, and if the launches and lighters and employees were unable to carry on continually this work they could not be employed readily in other duties.

The railroad to Antipolo passes an extensive outcrop of basalt in the vicinity of Antipolo Falls which is to the north of Binangonan Peninsula in the same zone of basaltic rocks. Samples of this stone were collected and tested for the sake of information. They showed 2.61 per cent of wear, or practically the same amount as the best grade of Talim rock; and although the fracture of this stone was somewhat better than that at the Talim quarry, it appeared that little could be gained by using it, and transportation, which would necessarily be by rail, would be too expensive. Between Antipolo and Taytay, in making a cut, a very hard stone was found and the railroad company called the attention of the division of mines to its occurrence. It was examined in the field and the exposures were found unsuitable for establishing a quarry. The rock was not tested, although a sample of it was obtained. Similarly, the limestone at the waterworks dam near Montalban was examined, since it was suggested that it might show better cementing values, and, being an unusually hard limestone, might prove suitable for macadam. The percentage of wear of this stone was found to be 3.97 per cent. Although it is superior limestone, it is not good enough to recommend for use on city streets; moreover, the color, which is nearly white, would be a serious disadvantage because of the strong reflection of light from it.

Up to this point in the field work, investigations had been carried on with the hope of satisfying the desire of the city officials to be informed of a location which would necessitate only water transportation. It was ascertained that a good quality of the rock could not be found situated under these conditions. It was believed that the hard stone found on the railway between Taytay and Antipolo was of superior quality, and it was judged from the geological formation that it would continue in a southerly direction to Angono, which is on the shore of the lake. At Angono, however, there is a belt of alluvial land lying between the hills and the lake shore, across which it would be necessary to use land transportation for a distance of approximately 2 kilometers. It was reported informally to the city engineer that this location would probably furnish the best rock available near Manila, and when it was seen that land transportation could not be avoided if a good quality of stone was to be secured, instructions were received to examine the vicinity of Angono. A hill situated to the northeast of the town contains a fine-grained, even-textured gabbroic rock, breaking with a good fracture. Samples of it were secured and tested in the abrasion machine. It showed 2.17 per cent of wear, and constituted at that time the best road material which had been received at the laboratory. Although the percentage of wear is not very much lower than that of the Talim rock, which is 2.57 per cent, the even quality of the stone and the possibility of obtaining it without admixture of quarry dirt and objectionable inferior material, such as is found in the quarry now operated, renders it far superior to the Talim product. It was learned during the investigation of the Angono locality that under the Spanish régime a quarry had been opened in the hills to the southeast of Angono, a tramway built to the border of the lake and a stone pier constructed from which the contents of cars could be dumped into scows. All of this installation was abandoned and sold before the American occupation and the quarry practically forgotten. Complete records, however, were discovered in the city archives. Before the location of the quarry had been visited, stone obtained from it was seen in the riprap on Pasig River in front of the municipal building at Pasig. This stone is suitable for many purposes and was used at various places in Manila by the Spanish, but it is brecciated, which uneven texture renders it much less desirable for road material than the stone in the hill northeast of Angono. Samples of the rock were selected and submitted to abrasion tests. It showed 2.31 per cent of wear on carefully selected pieces and it is probable that the run of the quarry would not be quite so good. It is unfortunate that the Spanish quarry is not suitable for supplying stone for macadamizing, since the utilization of what remains of the tram grade and the stone pier would save a considerable expense. Steps have been taken by the city to secure a title to the new quarry site northeast of Angono, and before long Manila may have better streets. The additional cost of the land transportation will probably be counterbalanced by the saving in maintenance.

Stone used on the roads of the provinces.—When the abrasion machine was installed, and a few samples of stone had been tested, a report of the results was made to the Director of Public Works, accompanied by an offer to test a series of samples of crushed stone from the quarries operated in the provinces. In accordance with this offer, a number of samples have been received and tested, and their percentage of wear will be found recorded in the table in the first part of this report. It has not been possible as yet to do any field work to determine whether the quarries which are operated are supplying the best rock which can be obtained, but it will be noticed that there is a wide divergence in the character of the stone used, and in some cases the percentage of wear is so excessive that if any better stone could be obtained, even at some additional cost, the roads might be improved and the expenses would perhaps be counterbalanced by the saving in maintenance. It is the desire of the Bureau of Science to aid as fully as possible in the economic problem of the use of road materials and it is hoped that further tests, and possibly some field work, may be carried on each year in coöperation with the Bureau of Public Works. It is planned to equip a laboratory with all the standard machines so that complete tests may be made. The necessary apparatus for this has already been ordered.

SAND, GRAVEL AND CRUSHED STONE AVAILABLE FOR CONCRETE CONSTRUCTION IN MANILA.

By George I. Adams.

(*From the Division of Mines, Bureau of Science.*)

While making a geological reconnaissance of southwestern Luzon, special attention was paid to the occurrence and availability of structural materials. In this area which produces no metallic minerals, the value of the stone, gravel, sand and clay products used during the last year surpassed that produced by any mining district in the Islands. Most of this output was used in and near Manila.

It is a surprising fact that sand and gravel taken from the Pasig and Mariquina Rivers have sold at the dredges for more per cubic meter than the average value of the gold per meter in good gold-dredging ground, and that the price of crushed stone at the quarries has in some cases been so high as to make the quarrying compare favorably, considering the expenses of production, with the mining of low-grade ores. The problem of the cost of structural materials in Manila should resolve itself without any special investigation. It is the purpose of this report to discuss the nature of the materials which are commonly used, to show where other and better ones may be obtained, and to indicate their relative efficiencies in concrete construction.

SAND.

Sources.—Most of the sand used in Manila is dredged from the Pasig River or dipped up in baskets and loaded into bancas by native divers. Some is also obtained from the Mariquina River which enters the Pasig just below the town of Pasig. The Pasig is the outlet of Laguna de Bay and does not bring coarse sediments from the lake. Accordingly, such sands and gravels as are found in its bed are received almost entirely from the Mariquina, which is its principal tributary, and the only large stream from the Eastern Cordillera which brings erosional products to the vicinity of Manila. (See fig. 1.)

North of Manila, the first large river which flows toward Manila Bay and contains an important amount of sand, is the Quingua, which flows from the Eastern Cordillera past Baliuag and Quingua and joins the delta system of waterways which enters Manila Bay. Near the station of Quingua, there is a switch of the Manila and Dagupan Railway which enters the river bed and there a large amount of sand, with which is mixed some gravel, has been taken out and used on the road as ballast. This material which will be referred to in this article as Quingua sand, can be transported to Manila by water, but the distance is great and the river near Quingua is often too shallow for navigation by launches. Transportation by rail at the present rates is prohibitive, and the cost as compared with usual railway rates seems excessive.

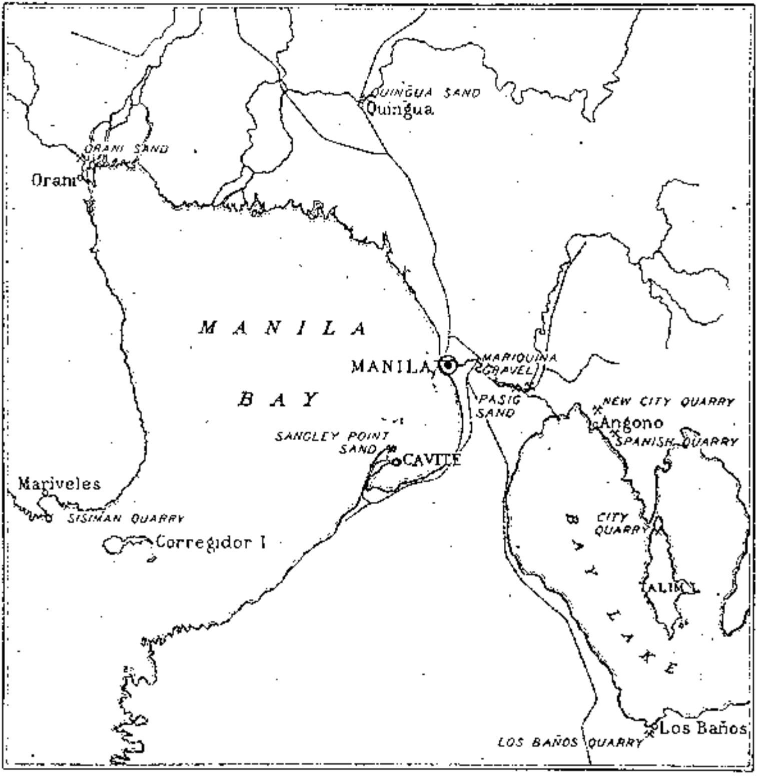

FIG. 1.—INDEX MAP OF LOCALITIES PRODUCING SAND, GRAVEL AND CRUSHED STONE.

South of Manila there are no streams entering the bay which contain deposits of gravel and sand, but all contribute small amounts to the beach. At Cavite, sand has been obtained in dredging the anchorage in front of the coal pockets on Sangley Point and considerable of it has been used in Manila; the beach also furnishes a similar material. This sand is referred to in this article under the name of Sangley Point sand.

Near the entrance to Manila Bay there are several places where beach sands composed largely of comminuted shells may be obtained. They have been used in building the fortifications at the entrance to the bay, but none have been brought to Manila, and it is probable that they will not be used here since better sands can be obtained more economically.

The sands used in Manila have been of only fair quality and it was the purpose of the investigation to find, if possible, one of superior quality. Sand from the Tarlac River at Tarlac, a railroad station situated halfway between Manila and Dagupan, was at one time recommended as a standard sand for use in testing cements, inasmuch as it was the best then known in the Philippines. An examination of the map showed that the sources of the Tarlac River are in the Western or Zambales Cordillera and it was accordingly concluded that rivers having their sources in these mountains and emptying into Manila Bay might carry the same kind of sand. It was decided that the Orani River was the most promising to investigate and upon visiting it there was found an abundance of sand similar to that of the Tarlac and of a slightly better quality. The river can be entered by launches and at low tide the sand can be loaded directly into barges. This sand is given the name of Orani sand in this report.

Nature of the sands.—The Pasig and Mariquina sand is a pebble sand which has resulted principally from the breaking down and wearing of andesite and basaltic rocks and gravels. The grains are in an advanced stage of decomposition and crush easily. The original rocks contain very little quartz and so there is not a noticeable amount of quartz in the sand. The few grains which may be seen in a small sample are probably mostly derived from quartz veins.

The Quingua sand is also a pebble sand, but it is derived from an area containing a great variety of rocks and many of its grains are hard and it contains a noticeable amount of quartz.

The Sangley Point sand is derived principally from basaltic rocks which occur fragmentally in the tuff formation which borders Manila Bay. The grains are in an advanced stage of decomposition and are readily crushed. In addition to the basaltic material many minute shells and fragments of larger ones are present.

The Orani sand is composed largely of clear sharp grains but little rounded. It is clean and sharp and produces a decided squeak when grasped in the hand. The clear grains are readily mistaken for quartz but in reality are plagioclase feldspars which have a similar hardness and specific gravity. The remaining minerals which it contains are pebbles and fragments of various igneous rocks. There are a few soft gravels of light specific gravity found with the sand but they are not more numerous than similar objectionable elements in the other sands.

Granularmetric analysis.—For finding the percentage of the different sized grains which constitute the sands, a series of sieves was obtained and the sizes of their meshes carefully calibrated. The analyses made by sieving the sands are illustrated graphically in the accompanying diagrams in which the curved lines represent the gradation of the sands and the broken line is an even grade line for the series of sieves used. This grade line runs from zero to 100 per cent on the 10 mesh sieve, which sieve corresponds approximately to the one having the smallest openings in the series used for stone and gravel. In order to ascertain the percentage held on any given sieve the amount indicated as passing the sieve should be subtracted from 100.

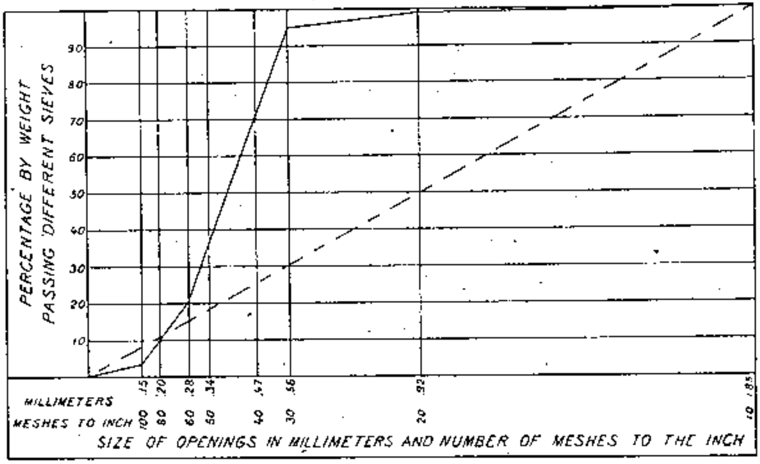

FIG. 2.—GRANULARMETRIC ANALYSIS OF PASIG SAND DIPPED UP IN BASKETS.

There is a large amount of fine-grained sand used in Manila on small jobs. It is dipped up in baskets and loaded into bancas by native divers. This sand is sometimes called banca sand. An analysis of some of it is shown in fig. 2. It will be seen that only 1 per cent is held on the 20-mesh sieve, but 5 per cent is held on the 30-mesh sieve, and the percentage passing the 100-mesh sieve is 2.6.

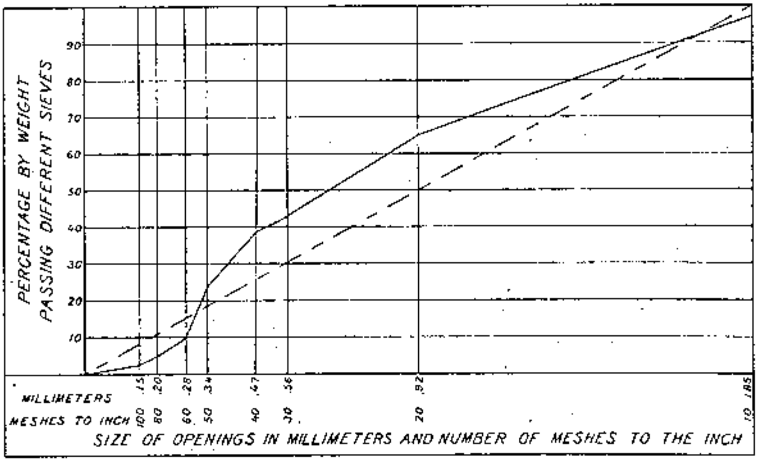

FIG. 3.—GRANULARMETRIC ANALYSIS OF PASIG SAND OBTAINED BY DREDGING.

The analysis of a good grade of Pasig sand is shown in fig. 3. This sand contains 2.3 per cent of fine gravel; 36 per cent is held on a 20-mesh sieve; 58 per cent is held on a 30-mesh and 2.6 per cent passes the 100-mesh.

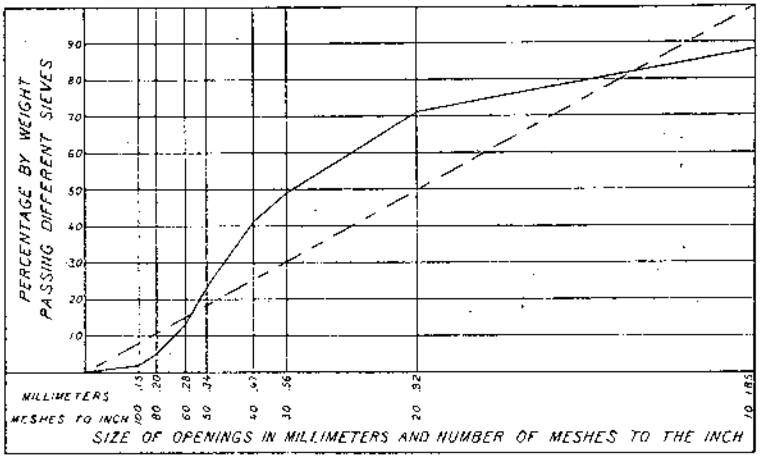

FIG. 4.—GRANULARMETRIC ANALYSIS OF PASIG SAND OBTAINED BY DREDGING.

The analysis in fig. 4 shows a sand containing 12 per cent of fine gravel. This sand runs a little coarser than the one shown in fig. 3. Twenty-nine per cent was held on a 20-mesh sieve, 51 per cent was held on a 30-mesh sieve and but 2 per cent passed the 100-mesh.

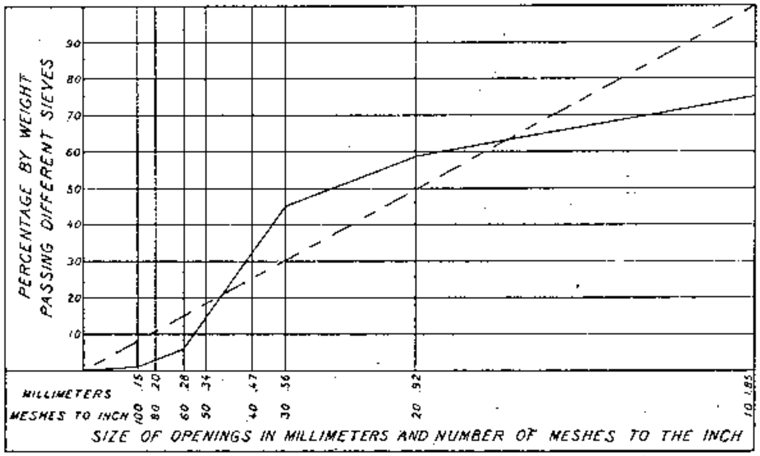

FIG. 5.—GRANULARMETRIC ANALYSIS OF QUINGUA RIVER SAND.

The sample of sand taken from the Quingua River shows 25 per cent of fine gravel mixed with it; 41.5 per cent was held on a 20-mesh sieve, 55 per cent was held on a 30-mesh sieve, and but 1 per cent passed a 100-mesh. This sand is clean and the most evenly graded of any of the samples examined.

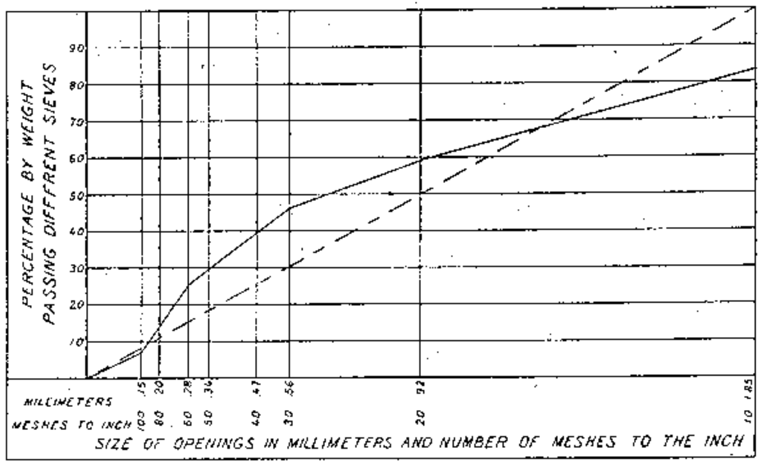

FIG. 6.—GRANULARMETRIC ANALYSIS OF SANGLEY POINT SAND.

There is a considerable percentage of coarse material in the Sangley Point sand which consists of decomposed pebbles and shells and shell fragments. In fig. 6 it is seen that there is 16 per cent of this coarse material, 41 per cent held on a 20-mesh sieve, 54 per cent on a 30-mesh, and 7 per cent passing a 100-mesh sieve. Accordingly the sand contains an objectionable amount of coarse material, consisting of broken shells and also considerable dirt.

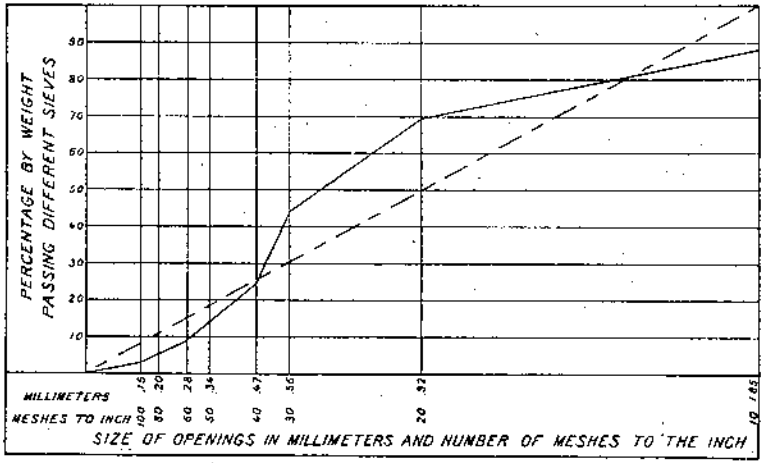

FIG. 7.—GRANULARMETRIC ANALYSIS OF ORANI SAND.

The analysis shown in fig. 7 indicates 12 per cent of fine gravel, 30.5 per cent held on a 20-mesh sieve, 56 per cent held on a 30-mesh and 3 per cent passing a 100-mesh. The Orani sand contains coarse sharp grains and very little fine material and practically no shell fragments.

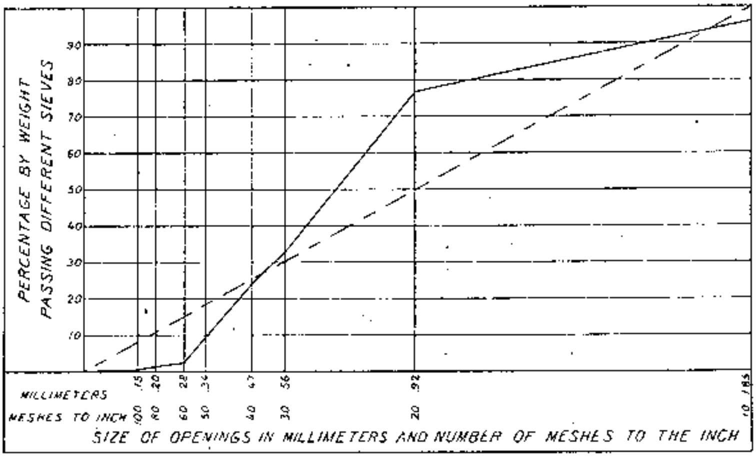

FIG. 8.—GRANULARMETRIC ANALYSIS OF ORANI SAND.

Another analysis of Orani sand is given in fig. 8 which shows 4.1 per cent of fine gravel; 23.4 per cent held on a 20-mesh sieve, 67.6 per cent held on a 30-mesh sieve, and 0.5 per cent passing a 100-mesh sieve. It will be noted that from the 60-mesh sieve to the 20-mesh the line indicating the analysis is nearly straight.

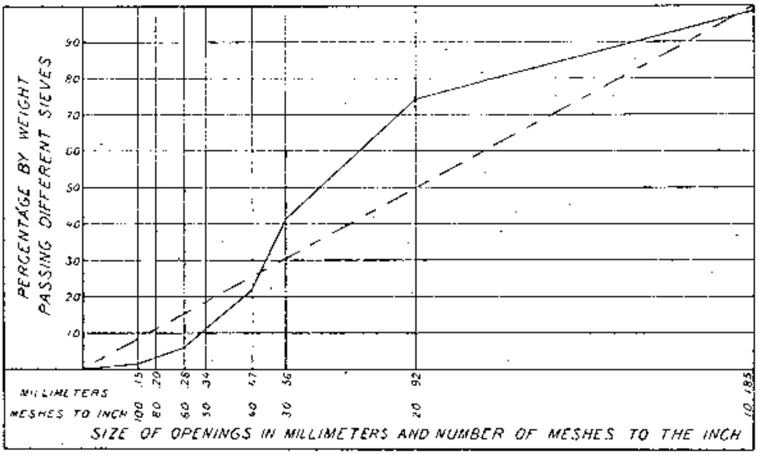

FIG. 9.—GRANULARMETRIC ANALYSIS OF TARLAC SAND.

The analysis of a sample of Tarlac sand is introduced for the sake of comparison, although the sand is not available for use in Manila. The percentage of fine gravel is shown to be 1.5; 26 per cent is held on a 20-mesh sieve, 59 per cent is held on a 30-mesh and 1.5 per cent passes a 100-mesh. This sample had been sieved to take out coarse pebbles.

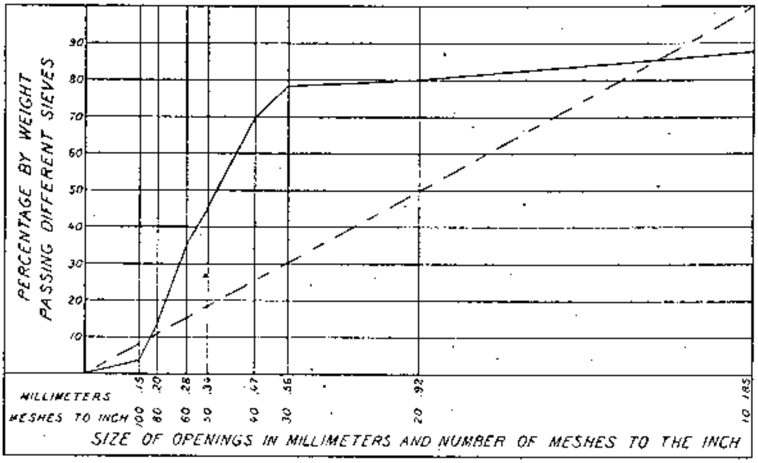

FIG. 10.—GRANULARMETRIC ANALYSIS OF BEACH SAND FROM NEAR CORREGIDOR.

In fig. 10 an analysis of a beach sand from near the entrance to Manila Bay is given. It shows 13 per cent fine gravel size, 20 per cent held on a 20-mesh sieve, 22 per cent held on a 30-mesh sieve and 3.3 per cent passing the 100-mesh. It is composed almost entirely of shell fragments.

All of the sands which have been analyzed granularmetrically show a certain amount of variation. The analyses presented above, however, may be regarded as fairly typical. Pasig sand, as it is used at present, is not screened according to any uniform specifications.

Efficiency.—Samples of sands from various localities above mentioned were sieved on a 20-mesh sieve and the portions passing were then sieved on a 30-mesh. The sands retained on the 30-mesh were used for making a series of tensile-strength briquettes in which a good quality of cement was employed in the proportion of one part of cement and three parts of sand. These briquettes were broken after seven days and their tensile strengths compared with similar briquettes made with crushed quartz used as a standard sand. The results of these tests, which, however, should be regarded as incomplete, are shown in the following table:

Comparative test of sands in tensile-strength briquettes.

Sand screened through 20-mesh and held on 30-mesh.	Percent of efficiency at 7 days.
Sangley	55
Pasig	66
Tarlac	91
Orani	97
Quingua	107
Crushed quartz	100

The variation of the efficiency in the Sangley, Pasig and Quingua sands, all of which are pebble sands, is probably largely due to the difference in the character of the rock fragments which compose them. Andesitic and basaltic materials are conspicuous in the Pasig sands and basaltic grains constitute nearly all of the rock material in the Sangley sands, while the Quingua contains harder materials which do not so readily decompose and become spongy or porous, but under the action of water are gradually worn down to smaller sizes by attrition and abrasion. The efficiency of the Sangley sand, which is the lowest, may be further accounted for by the presence of many minute shells which do not fill with cement.

The fact that the Quingua sand is more efficient than the Orani and Tarlac, is probably due to the shape of the grains, which being rounded decreases the voids. Moreover, the vitreous surfaces of the crystal fragments in the Orani and Tarlac sands may also cause them to wet less readily than the grains of the Quingua, which have minutely pitted surfaces and capillary openings.

A comparison of the efficiency of the Pasig and Orani sands was also made by crushing concrete blocks which were made in a uniform way, using the same cement and Pasig gravel in each, but different sands. In order to follow working conditions the sands were both screened through a 4-mesh sieve. The blocks were stored twenty-five days in moist air and afterwards exposed to the sun and rain. They were crushed at the end of three months and gave the following results: Pasig sand, 1:2:5: mixture, average of three breaks; first crack, 912 pounds per square inch; ultimate, 1,542 pounds per square inch. Orani sand, 1:2:5 mixture, average of three breaks; first crack, 1,568 pounds per square inch; ultimate, 1,951 pounds per square inch.

Specific gravity, percentage of voids and weights per cubic meter.—Samples of the various sands were screened through a 10-mesh sieve and their specific gravities, percentage of voids and weights per cubic meter determined as shown in the following table:

Sand.	Specific gravity.	Percentage of voids.	Weight per cubic meter in kilograms.
Pasig	2.67	37.5	1,671
Quingua	2.71	35.2	1,757
Sangley	2.58	42.0	1.500
Orani	2.62	42.9	1,500
Corregidor	2.77	41.7	1,615

Photographs of these samples are shown in Plates I and II.

GRAVELS.

Source of materials.—The only gravel readily available for use in Manila is that which is dredged from the Mariquina River. The gravel in the Pasig has already been largely dredged out in maintaining the channel of the river, and although it is partially renewed during the flood season when the Mariquina gravel is brought in, it does not furnish a satisfactory dredging ground.

The Quingua gravel at Quingua is too fine. Further up the river near Baliuag, the same river contains a good quality of gravel but it is not accessible.

Nature of the gravel.—The Mariquina gravel is derived principally from basaltic and andesitic rocks, as has already been explained in discussing the sands of the stream. Many of the pebbles are partially decomposed and show altered spots and "pin holes" when broken. The basaltic gravels frequently have a dense texture and are friable, being in many respects similar to the Talim basalt which is used in macadamizing the streets of Manila, and which has proved rather unsatisfactory on account of its friability.

Granularmetric analysis.—By sieving samples of the gravel on a series of stone and gravel sieves with round openings, the percentage of the different sizes in several samples has been determined. These analyses are shown graphically by the plotted curves in the following figures and they may be compared with the even grade line which is shown by the broken line drawn from zero to 100 per cent on the sieve through which the gravel should all pass according to the specifications.

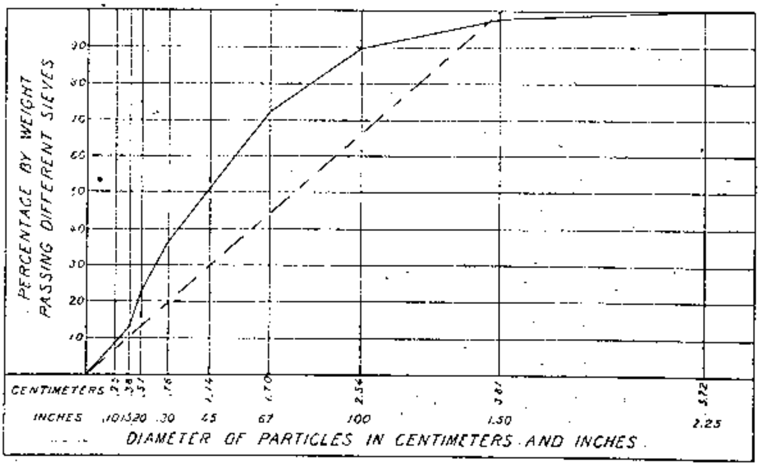

FIG. 11.—GRANULARMETRIC ANALYSIS OF MARIQUINA GRAVEL TO PASS A 1.5-INCH OPENING.

The analysis in fig. 11 shows 2.2 per cent of oversize and 8.7 which passes the smallest sieve. The percentage of voids is 31.2, and with material under 0.1 inch screened out, 33.5

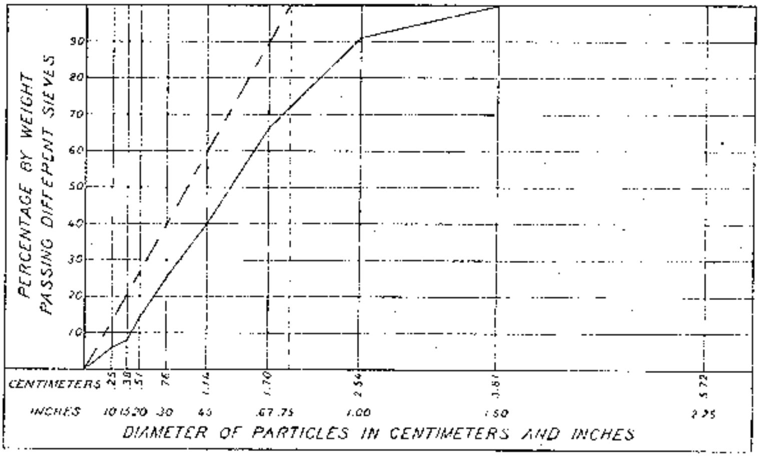

FIG. 12.—GRANULARMETRIC ANALYSIS OF MARIQUINA GRAVEL TO PASS A 0.75-INCH OPENING.

The analysis shown by fig. 12 indicates 27 per cent of oversize gravel and 6 per cent passing the smallest sieve. Voids 29.1, with material under 0.1 inch screened out, 32.9 per cent.

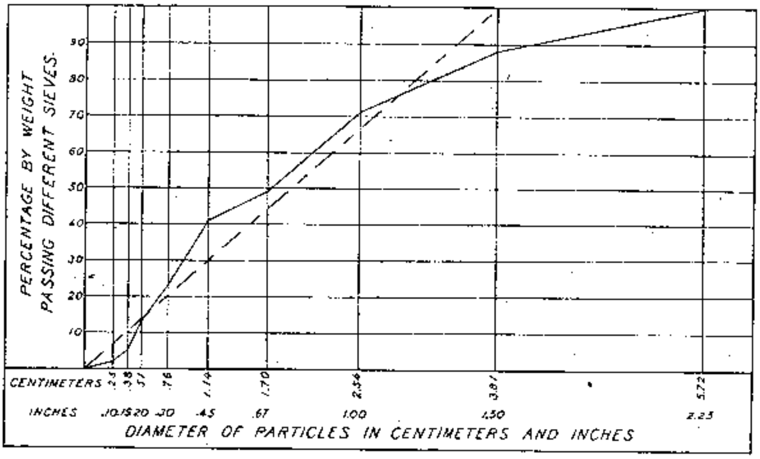

FIG. 13.—GRANULARMETRIC ANALYSIS OF MARIQUINA GRAVEL TO PASS A 1.5-INCH OPENING.

The analysis in fig. 13 shows 12 per cent of oversize gravel and 2 per cent passing the smallest sieve. Voids, 31.2 per cent.

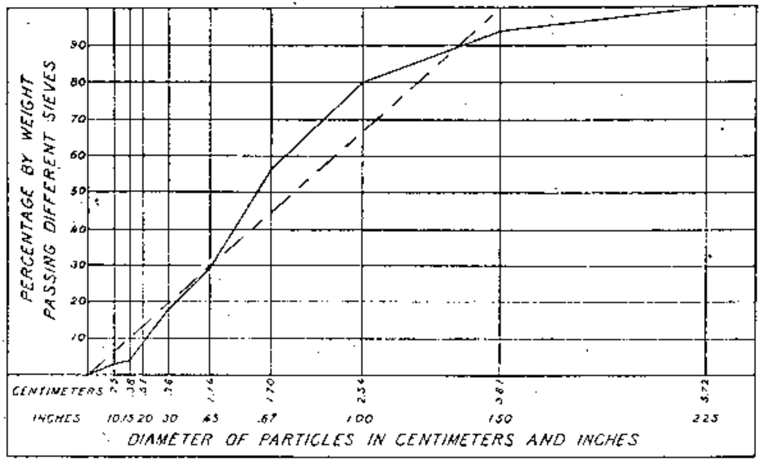

FIG. 14.—GRANULARMETRIC ANALYSIS OF MARIQUINA GRAVEL TO PASS A 1.5-INCH OPENING.

The analysis in fig. 14 shows 6 per cent of oversize and 3 per cent passing the smallest sieve. Voids, 31.5 per cent.

The Maraquina gravel varies greatly in character since it is not carefully screened as the analyses above will show.

Efficiency.—There is no standard gravel with which gravels may be compared after the manner that sands are compared with standard sands. It might be well to select a superior gravel to use as a standard in testing the efficiency of gravels in concrete. Cubes could be made with a good cement, a given sand or standard sand, and the standard gravel, and these could be used for comparing the crushing strength of cubes of concrete in which the gravel to be tested is combined with the same cements and sand in the same proportions. This would be especially helpful when a gravel is found to break under a pressure which is less than that required to crush the mortar of the concrete. In most gravels the smaller sizes have a lower crushing limit since they are in a more advanced stage of decomposition. It would, therefore, seem desirable that a standard gravel should be of small size. At Calapan, in Mindoro, a gravel was seen which had been obtained from a beach west of the port. It consists very largely of white quartz pebbles which will pass a 1.14-centimeter circular opening and be retained on a sieve with 0.51-centimeter circular openings. There are at present with the quartz pebbles some rounded fragments of shells and corals, and a few schist pebbles, but these can easily be picked out because of their texture and color. It is proposed to see what results can be obtained by using this material as a standard gravel and if it is satisfactory to recommend it for use. It is believed that quartz pebbles will be superior to crushed stone for the purpose of comparative tests of gravels because of the similarity of the shapes of and the absence of partially developed fractures which are found in the small sizes of crushed stone.

Thus far there has been accumulated only a small amount of data concerning the efficiency of Pasig gravel. In crushing concrete cubes, Mr. Reibling found that in several cases the gravel was weaker than the mortar. In one cube 40 per cent of the gravel broke.

CRUSHED STONE.

Sources.—The only large commercial quarry near Manila is situated at Sisiman, near Mariveles, at the entrance to Manila Bay. This point is so distant that considerable expense is required for transportation, nevertheless a large amount of the stone has been used in Manila for concrete construction. There are other quarry sites near Sisiman, some of which show a better stone and there are places which are better protected from storms.

Near Los Baños on Laguna de Bay a quarry was formerly operated for road material. To obtain stone from this situation a long tow across Laguna de Bay is necessary, and in addition land transportation to the border of the lake is required.

The city has for some time operated a quarry on Talim Island, but present indications are that the plant will be moved to a better site.

Under the Spanish régime a quarry was opened in the hills to the southeast of Angono, and a road bed was constructed to the border of the lake and a stone pier built out into the water to enable the dumping of stone from tram cars into scows. This quarry has not been operated recently. To the north of Angono the writer has found a superior grade of rock which the city is contemplating using for macadamizing Manila streets, and it is probable that a quarry will soon be opened there. Land transportation will be required for bringing the rock to the lake shore.

It appears that there are no good quarry sites of hard rock nearer Manila than the vicinity of Angono. Crushed rock obtained at this place can be brought in small barges which can enter the esteros in Manila and permit of the landing of the material at many places; this is an advantage since it saves land transportation in Manila. Rock from the Sisiman quarry, or others which might be opened near it, could best be transported on large scows and these, while they could land conveniently on the water front, could not ascend the Pasig River beyond the bridge of Spain nor enter the esteros.

Nature of the stone.—The Sisiman stone is a gray andesite which in the quarry shows columnar structure. This structure favors the quarrying of large stone. Near by the andesite has a somewhat better texture and is a little harder, and at a few points there is a dark andesitic rock which is superior to the gray andesite, but it is doubtful whether it can be obtained economically. The rock at Los Baños is andesitic with a crystalline structure and is of good quality.

The Talim quarry supplies a basaltic rock which is dense and shows practically no crystalline structure to the unaided eye. It is rather friable and breaks with a splintery fracture. Crushed stone from the quarry usually contains a considerable admixture of softer material and dirt, especially when operations are carried on during the rainy season. The old Spanish quarries near Angono show a dark green brecciated gabbroic rock. A clean crushed stone can be obtained from it, and, although the rock is brecciated and accordingly uneven in texture, it is believed that it is suitable for concrete work, but not so desirable for road material. When the city quarry is moved to the new location north of Angono, it will supply a clean, fine grained, crushed stone of very even texture. This is the best rock which can be obtained for use in Manila.

Granularmetric analysis.—Crushed stone as it comes from the crusher is usually very uniformly graded. In this respect it differs materially from gravels. Unless it contains a considerable amount of fines, it can be used just as it comes from the crusher. Usually the fines can be washed out by pouring water over the stone when it is measured up in baskets for obtaining the proper proportions in mixing concrete.

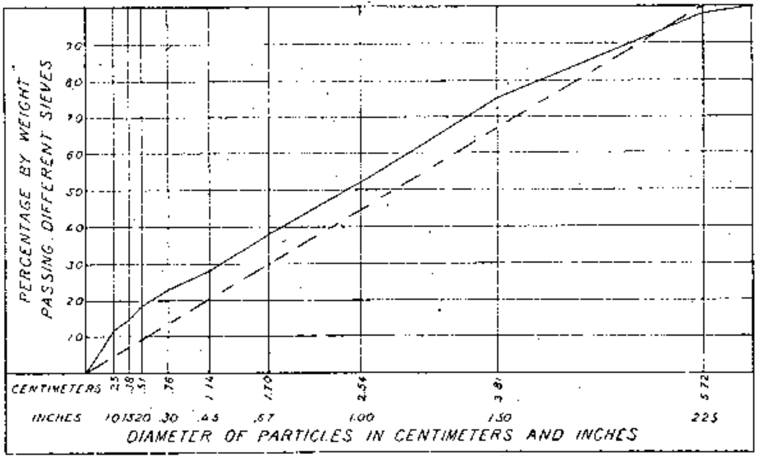

FIG. 15.—GRANULARMETRIC ANALYSIS OF SISIMAN CRUSHED STONE CONTAINING FINES.

In fig. 15 the granularmetric analysis of Sisiman rock is shown just as it was delivered from the crusher. Percentage of voids, 37.4; $11\frac{1}{2}$ per cent passed the smallest sieve and 98 per cent passed the $2\frac{1}{4}$-inch sieve. Between these two points as plotted the analysis runs in a nearly straight line. In fig. 16 the granularmetric analysis of the same sample of stone which was shown in fig. 15 is replotted excluding the fines which passed the smallest sieve. In this diagram the analysis follows very closely the even grade line. The percentage of voids in a sample of washed Sisiman rock was found to be 43.4.

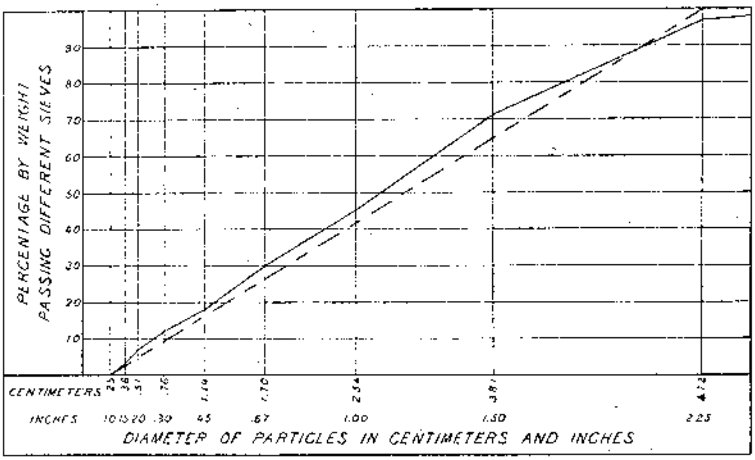

FIG. 16.—GRANULARMETRIC ANALYSIS OF SISIMAN CRUSHED STONE, FINES EXCLUDED.

Efficiency.—No tests have been made to show the strength which may be obtained in concrete using the Sisiman stone. It appears to be very satisfactory when used as crusher run. It may, however, prove to show a higher percentage of efficiency when selected sizes are used. The fines from the rock if replotted as sand, show 23 per cent passing a 100-mesh sieve. This is really a rock flour, and as has already been suggested above, should be excluded from concrete work by washing the stone.

The crushing strength of Sisiman stone was determined by dressing a block to true edges and crushing it in a compression strength machine. It broke under a pressure of 1,115 tons to the square foot (1088. kilograms per square centimeter).

At the writer's suggestion, the United States Army engineers opened a quarry on Corregidor. The stone is a white dacite, very much sheared and jointed so that it requires but little breaking up for feeding to a crusher. A block of this stone dressed to true edges crushed under a pressure of 1,009 tons to the square foot (985. kilograms per square centimeter).

A stone from the site of the new city quarry near Angono crushed under a pressure of 1,584. tons to the square foot (1547. kilograms per square centimeter).

It is proposed to make further tests of the crushed stone available for use in Manila and include in this work all the quarries which have been mentioned above.

AGGREGATES.

Pasig sand and Mariquina gravel.—In most of the concrete work in Manila, Pasig sand and Mariquina gravel are used. In the tests recorded above the sand in tensile strength briquettes showed in a seven-day test but 65 per cent efficiency when compared with crushed quartz, and it has been demonstrated by crushing concrete blocks that a large percentage of the gravel breaks under a lower compressive force than the mortar will sustain. Concrete blocks of Pasig sand and Mariquina gravel in the proportions 1:2:4–1:2:5–1:2:6 showed but little difference in compression tests. This is explained by the fact that the gravel is weak and that the concrete crushed below the ultimate strength of the mortar.

Sangley sand and Sisiman crushed stone.—This combination has been used extensively, as, for example, in the construction of the sewers. The stone is of good quality since a block of it crushed under a pressure of 1,115 tons per square foot. The Sangley Point sand has at seven days an efficiency of but 55 per cent. The crushing strength of concrete made with this aggregate has not been determined, but it is probably low, since the efficiency of the sand is low and the ultimate strength of the mortar will not approach that of the stone.

Sangley sand and Mariquina gravel.—This is the poorest aggregate which is used in Manila, and yet Mariquina gravel has been substituted for Sisiman stone in some cases where Sangley sand was used. The crushing strength of concrete made from these materials is yet to be determined.

Pasig sand and Sisiman stone.—This aggregate has not been much employed. It should prove superior to those above mentioned but concrete made from it will probably fall far below the limit of the stone, since the sand has an efficiency of only 66 per cent in seven-day tensile-strength tests.

Orani sand and Pasig gravel.—This aggregate has been used in the base of concrete paving blocks where but little strength is required. For constructions requiring great strength the combination is not desirable, since the gravel is not efficient. The mortar used in the surface of the paving blocks was found to be superior in quality to those of blocks made with Pasig sand.

Orani sand and crushed stone.—Orani sand and Sisiman stone have been used in reconstructing the shaft of the Magallanes Monument. This aggregate should develop greater strength than any combination above mentioned. Other crushed stone available for use in Manila may be substituted for Sisiman stone and some of it may even prove better, as for exaple, the Angono rock. The Orani sand showed 97 per cent efficiency in seven-day tensile-strength tests, and the strength of good crushed stone is higher than mortar made with this sand.

CONCLUSION.

The field work necessary to make known the sources and nature of the sand, gravel and crushed stone available for use in Manila has been completed. An extensive deposit of a superior sand has been discovered in the Orani River and some of this sand is now being used. A new quarry site has been selected for the city near Angono, the stone from which is considerably better than what is now being used from the Talim quarries and is the best obtainable for macadamizing the streets of Manila and is in every way suited for concrete work.

The testing of the materials, while incomplete, is sufficient to show their relative efficiencies and to check the conclusions arrived at from the geologic examinations. Further tests extending over longer periods of time and embracing all the conditions which will be met with in practice will be made in the testing laboratory of the Bureau of Science as soon as the facilities will permit.

The economic problems of the cost of quarrying, dredging and transporting, and the more vital one of obtaining the best results in the use of the materials is beyond the scope of this paper, but some data have been supplied to assist in their solution.

For the tests of materials which are reported in this article the writer is indebted to Mr. W. C. Reibling, in charge of the cement-testing laboratory of this Bureau, and to F. D. Reyes, assistant in the cement laboratory.

LIST OF ILLUSTRATIONS.

TEXT FIGURES.

FIG. 1. Index map of localities producing sand, gravel and crushed stone.
2. Granularmetric analysis of Pasig "banca" sand.
3. Granularmetric analysis of Pasig "dredge" sand.
4. Granularmetric analysis of Pasig "dredge" sand.
5. Granularmetric analysis of Quingua sand.
6. Granularmetric analysis of Sangley Point sand.
7. Granularmetric analysis of Orani sand.
8. Granularmetric analysis of Orani sand.
9. Granularmetric analysis of Tarlac sand.
10. Granularmetric analysis of Corregidor sand.
11. Granularmetric analysis of Mariquina gravel to pass 1.5-inch opening.
12. Granularmetric analysis of Mariquina gravel to pass a 0.75-inch opening.
13. Granularmetric analysis of Mariquina gravel to pass a 1.5-inch opening.
14. Granularmetric analysis of Mariquina gravel to pass a 1.5-inch opening.
15. Granularmetric analysis of Sisiman crushed stone, containing fines.
16. Granularmetric analysis of Sisiman crushed stone, fines excluded.

PLATES.

PLATE I. Fig. 1. Pasig sand. Fig. 2. Sangley sand. Fig. 3. Orani sand.
II. Fig. 1. Quingua sand. Fig. 2. Corregidor sand. Fig. 3. Tarlac sand.

FIG. 1. PASIG SAND.

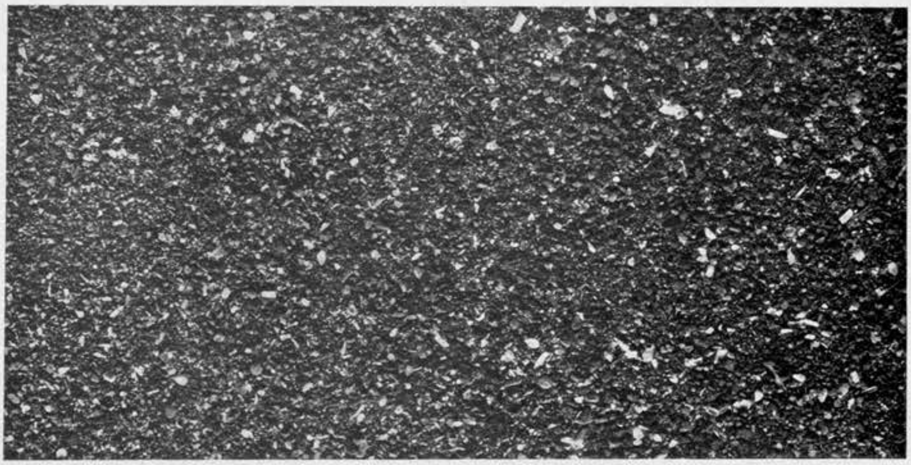

FIG. 2. SANGLEY SAND.

FIG. 3. ORANI SAND.

PLATE I.

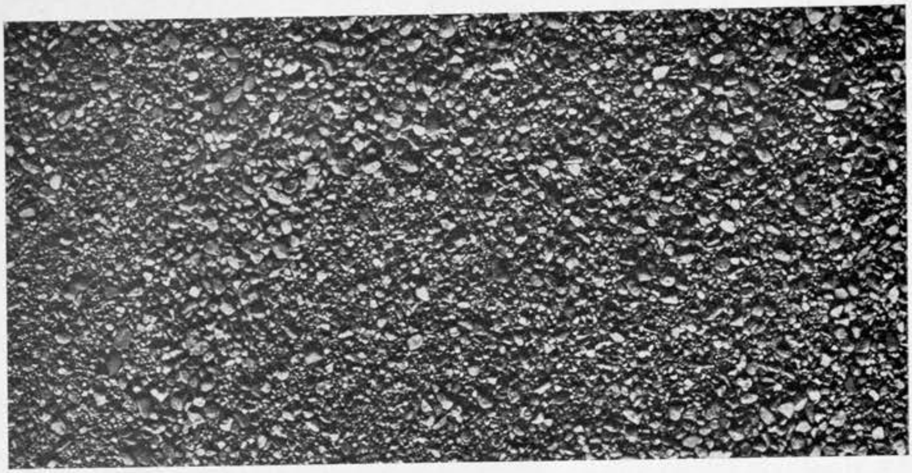

FIG. 1. QUINGUA SAND.

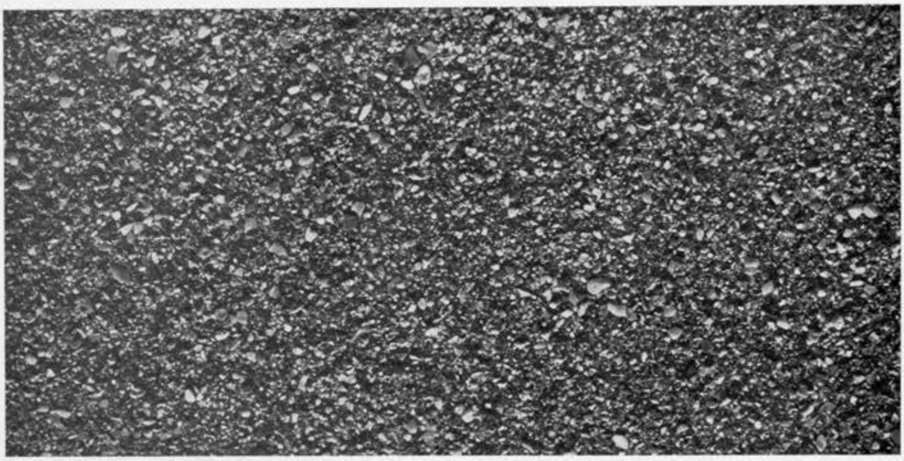

FIG. 2. CORREGIDOR SAND.

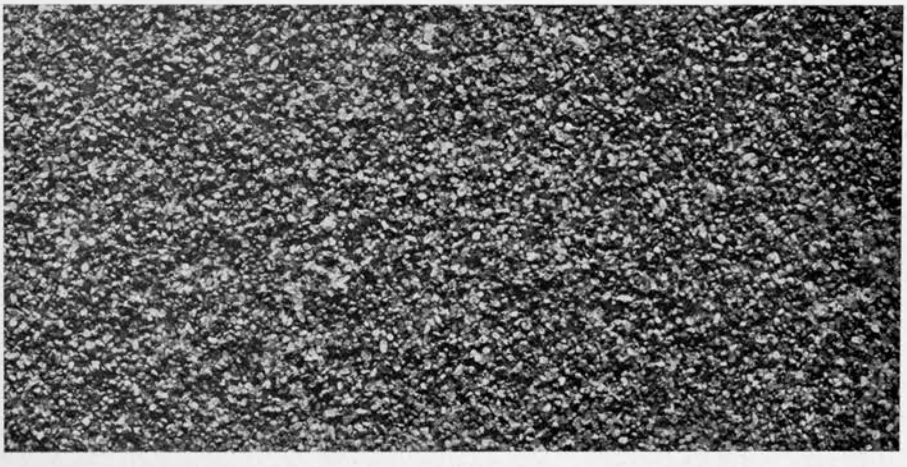

FIG. 3. TARLAC SAND.

PLATE II.